Biogeoclimatic Units and Ecosystem Associations of the Kimsquit Drainage

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BIOGEOCLIMATIC UNITS AND ECOSYSTEM ASSOCIATIONS OF THE KIMSQUIT DRAINAGE

By

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A Cooperative Project Between the Ministries of Environment and Forests

Wildlife Branch
Ministry of Environment
Victoria, B.C.

Research Branch
Ministry of Forests
Victoria, B.C.

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INTRODUCTION

In July and August of 1983, a vegetation survey, funded by the Fish and Wildlife Branch, Ministry of Environment, was undertaken in the Kimsquit River drainage. This vegetation survey was a component of the coastal grizzly project, a cooperative project between the Ministries of Environment and Forests (Archibald 1981; Archibald and Hamilton 1982; Hamilton 1983).

The objectives of the vegetation survey were:

1. to define and describe biogeoclimatic units
2. to define and describe ecosystem associations
3. to map (at 1:20 000) biogeoclimatic units, ecosystem associations, and successional stages

A long-term objective, requiring additional field work, is to identify the seasonal habitat requirements of coastal grizzlies (Hamilton 1983).

These objectives were accomplished in part by implementing a vegetation inventory program. Sampling was concentrated in areas of known bear use (avalanche tracks, floodplain, and mesic slopes). Data covering all ecosystem associations, in a biogeoclimatic framework, were collected and analyzed. The raw data (119 plots) are on file with the Fish and Wildlife Branch, Ministry of Environment, Victoria, B.C.

This report describes the vegetation of the CWHi3 variant and the Mountain Hemlock zone in the Kimsquit River drainage. No work was done in the Alpine Tundra zone. The information presented here is an expansion of the map legend for Kimsquit - Ecosystem Associations (Clement 1984). The study area is outlined in Figure 1. For a more detailed description of the study area see Hamilton (1983). A report by the Ministry of Forests (Yole et al. 1982) describing the Coastal Western Hemlock zone has been drawn from extensively and where relevant is quoted directly. That report contains a detailed account of regional physiography, surficial material, bedrock geology, climate, and soils.

In conjunction with this study, a detailed vegetation - soil inventory was conducted in the lower Kimsquit River valley by Ministry of Forest staff (Banner et al. 1984). This area coincides with the geographic extent of the CWHh3 variant (not described in this report).

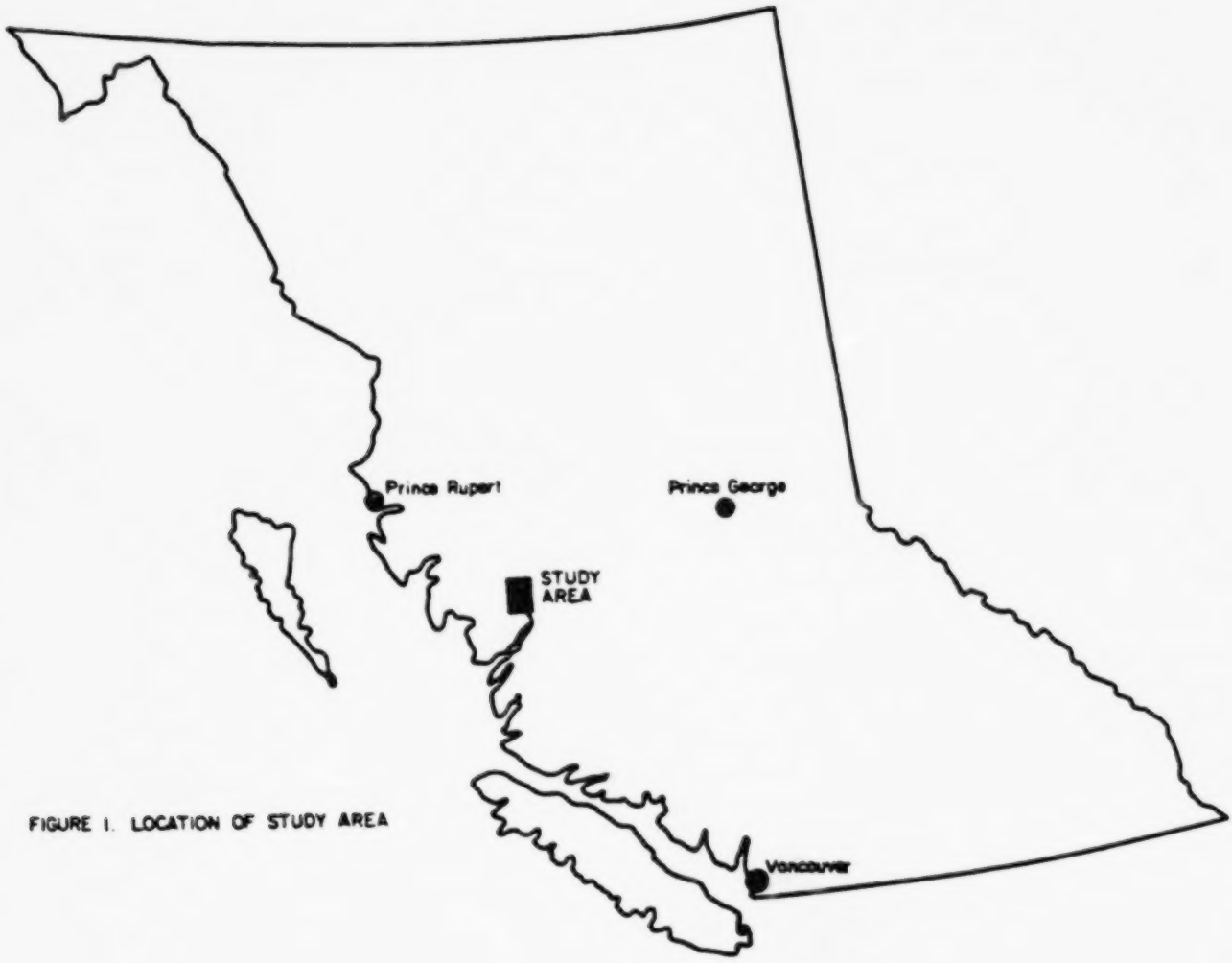

FIGURE 1. LOCATION OF STUDY AREA

METHODS

The vegetation inventory was conducted following standard sampling techniques described in Walmsley et al. (1980). Accordingly, vegetation data were recorded on computer - compatible data sheets produced by the Ministry of Forests and Ministry of Environment.

Road access was limited to the lower west side of the Kimsquit River. As a result, traverses were run on foot in the lower valley at selected locations to cover maximum vertical variation. Difficult terrain and extremely steep slopes limited the number of transects. Only one transect was located on the east side of the lower Kimsquit River. Five days of helicopter time allowed for a cursory survey of upper side drainages and in order to maximize use, sampling was concentrated in areas and habitat of known bear use. In addition, four days of camping at Kimsquit Lake resulted in detailed sampling of the surrounding area.

One hundred and nineteen plots were selected and sampled to characterize the range of ecosystem associations within biogeoclimatic units. Because of the limited access, the transitional subzones of the Mountain Hemlock zone were not adequately sampled. At each plot location, a list of all vascular and non-vascular plants was made. A voucher specimen of most vascular plants was collected (203 specimens were collected and are on file with R. Archibald, Ministry of Environment, Victoria). Only readily identifiable non-vascular plants were recorded on data sheets; no effort was made to collect unknown species. For each plant species, at each plot location, percent cover, distribution, vigour, and phenology (excluding trees) were recorded. For stands less than 120-years-old, tree ages were determined. At most sites, soil pits were dug and horizons, depths, coarse fragments, texture, colour, and roots were described.

Two zones, five subzones, and five variants comprised the biogeoclimatic units of the study area. A total of twenty-three ecosystem associations were characterized. Three associations recognized by Yole et al. (1982) were conglomerated into one association because of similarities and scarce occurrence. Where applicable associations were named following Yole et al. (1982). Other associations were named after dominant plant species in relevant vegetation layers.

ECOSYSTEM CLASSIFICATION

BIOGEOCLIMATIC UNITS

The classification of biogeoclimatic units was based primarily on climatic relationships. Zones, subzones, and variants were identified using different vegetation criteria as they reflected various levels of climatic influence. The biogeoclimatic unit symbols are composed of three parts: zone, subzone, and variant. For example with the symbol CWHi3, CWH represents the zone, i the subzone, and 3 the variant. If variants are unidentified, a number will be missing from the symbol.

Biogeoclimatic zone

A biogeoclimatic zone is a large geographic area with a broadly homogenous macroclimate (Yole et al. 1982). In response to this overall macroclimate, climax tree species (shade-tolerant) occur throughout the zone, most commonly on mesic sites. Characteristic soil-forming processes (e.g. podzolization) and commonly occurring climax shrub, herb, and moss species typify a zone. Zones are usually named after one or two dominant climax tree species.

Biogeoclimatic subzone

Biogeoclimatic subzones are subdivisions of zones based on regional climatic differences. Although the climax tree species characteristic of the zone are still common, subtle differences may occur in climax ecosystem associations. Subzones within a zone may have different levels of productivity, with inherent implications for wildlife management.

Biogeoclimatic variant

Variation within subzones is recognized in the form of variants. Variants reflect further differences in regional climate, and are generally recognized for areas that are drier, wetter, snowier, warmer, or colder than other areas in the subzone (Yole et al. 1982). Differences in vegetation may occur in the form of atypical seral tree species, diverse successional stages, or the overall vegetation pattern.

ECOSYSTEM ASSOCIATION

An ecosystem association is defined as all ecosystems (land areas plus biota) capable of producing vegetation belonging to the same plant association at climax (Yole et al. 1982). Although the associations are defined solely on vegetation characteristics, similarities in site conditions (aspect, slope, elevation), parent materials, soil development, moisture regime, and nutrient regime are inherent. The ecosystem variation (defined on slight vegetative deviations) and ecosystem phase(defined on differences in landforms, parent materials, and soil properties) are two further levels of ecosystem classification not developed in this study. This is due to limited data and inability to relate to soils and parent materials on a map base. The ecosystem associations are labelled in two ways: a common name, simplified form, and a latin name, complex form (characteristic plant species in each vegetation layer present). In addition, numerical symbols are assigned to each association. Normally the zonal or mesic association for a biogeoclimatic unit is called 01,

with the rest in order of improving moisture (02 xeric, 03 submesic, 04 subhygric, etc.). An association may occur over a range of parent materials or soil developments, although there are similarities such as depth of material, presence of coarse fragments or drainage. Moisture regime and nutrient regime are usually relatively homogenous throughout an association, for it this similarity which results in the occurrence of the same plant species and ultimate climax plant association. Initial identification of ecosystem associations was based on preliminary field work. The final naming and description of associations is based on the comparison of data (from sample plots) and resultant sorting into meaningful ecological groups after Mueller-Dombois (1974). Detailed synthesis and overall frequency tables for associations are contained in the Appendices.

SUCCESSIONAL STAGES

Although not normally a component of ecosystem classification, successional stages are an integral part of the ecology of a given area. In order to produce a map which can be used for assessing wildlife habitat, it is necessary to recognize and define the various successional stages leading to each climax ecosystem association. To this end, in cooperation with Ministry of Forests staff (Banner et al. 1984), the following categories were utilized:

A	nonvegetated	]- pioneer seral
B	grass-forb	]- pioneer seral
C	shrub seedling	]- pioneer seral
D	pole sapling 10-39 years	
E	maturing seral 40-100 years	
F	young climax >40-<120 years	
G	mature climax >120 years	
H	disclimax	

Where significant differences of vegetation composition for successional stages was determined by sampling, the stages were described within associations.

BIOGEOCLIMATIC UNIT DESCRIPTION

Because only one variant and one subzone of the Coastal Western Hemlock zone occur in the study area, it is described as a unique unit. Four subzones comprise the MH zone and are described independently. No variants have been identified in the Mountain Hemlock zone. No sampling was done in the Alpine Tundra zone.

CWHi3 - COASTAL WESTERN HEMLOCK ZONE; MID-COAST WETTER MARITIME SUBZONE; EASTERN TRANSITIONAL HEMLOCK (AMABILIS FIR) VARIANT

General Description

The CWHi3 variant occurs throughout the Kimsquit River drainage at relatively low elevation. In the lower Kimsquit valley (below Salient Creek), it occupies an elevational band between the CWHh3 and the MHd (Figure 2). On north and east aspects, it begins above 360 m and extends up to 760 m. On south and west aspects, it occurs above 515 m and extends up to 910 m. The CWHi3 extends into most major side tributaries (Hoam, Cornice, Pollard, Robson, Foresight, King George, Salient, Trapper, Salahagen, Smaby, Chatsquot, and Siah creeks) although the influence of cold air from glaciers tends to limit its extent to about 300 m. Above Salient Creek in the Kimsquit River valley, the variant descends below 210 m.

In general the climate of the variant is characterized by moist, warm summers and cool to cold winters with relatively high snowfall (Yole et al. 1982). Because of the steepness of slopes, colluvial deposits dominate the landscape. Very shallow soils over rock, and exposed bedrock are also common. Orthic Humo Ferric Podzols and Orthic Ferro Humic Podzols are the most commonly occurring soils.

Vegetation[1]

Tsuga heterophylla (Western hemlock) and Abies amabilis (Amabilis fir) are the dominant climax tree species. Thuja plicata (Western red cedar) is sporadic and Pseudotsuga menziesii (Douglas fir) is rare. Picea sitchensis (Sitka spruce), Populus trichocarpa (Black cottonwood) and Alnus rubra (Red alder) are locally abundant on floodplain sites. The shrub layer, usually well developed, is often dominated by Vaccinium alaskaense (Alaskan blueberry) and Vaccinium ovalifolium (Oval-leaved blueberry). Other shrubs which may dominate, depending on site conditions, include Oplopanax horridus (Devils'-club), Rubus spectabilis (Salmonberry), Cornus sericea (Red-osier dogwood), Alnus viridis subsp. sinuata (Sitka mountain alder) and Salix spp. (Willow). Herbs vary considerably in composition and cover depending on light, moisture, and nutrient conditions. Under climax forests herbs commonly found, often in sparse amounts, include Cornus unalaschkensis (Bunchberry), Rubus pedatus (Creeping raspberry), Clintonia uniflora (Bluebead clintonia) and Streptopus roseus (Simple-stemmed twistedstalk). A thick continuous moss layer is characteristic of climax forests. Common species are Rhytidiadelphus loreus, Rhytidiopsis robusta, and Hylocomium splendens.

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1 Latin and common plant names are adapted from Taylor and MacBryde (1977).

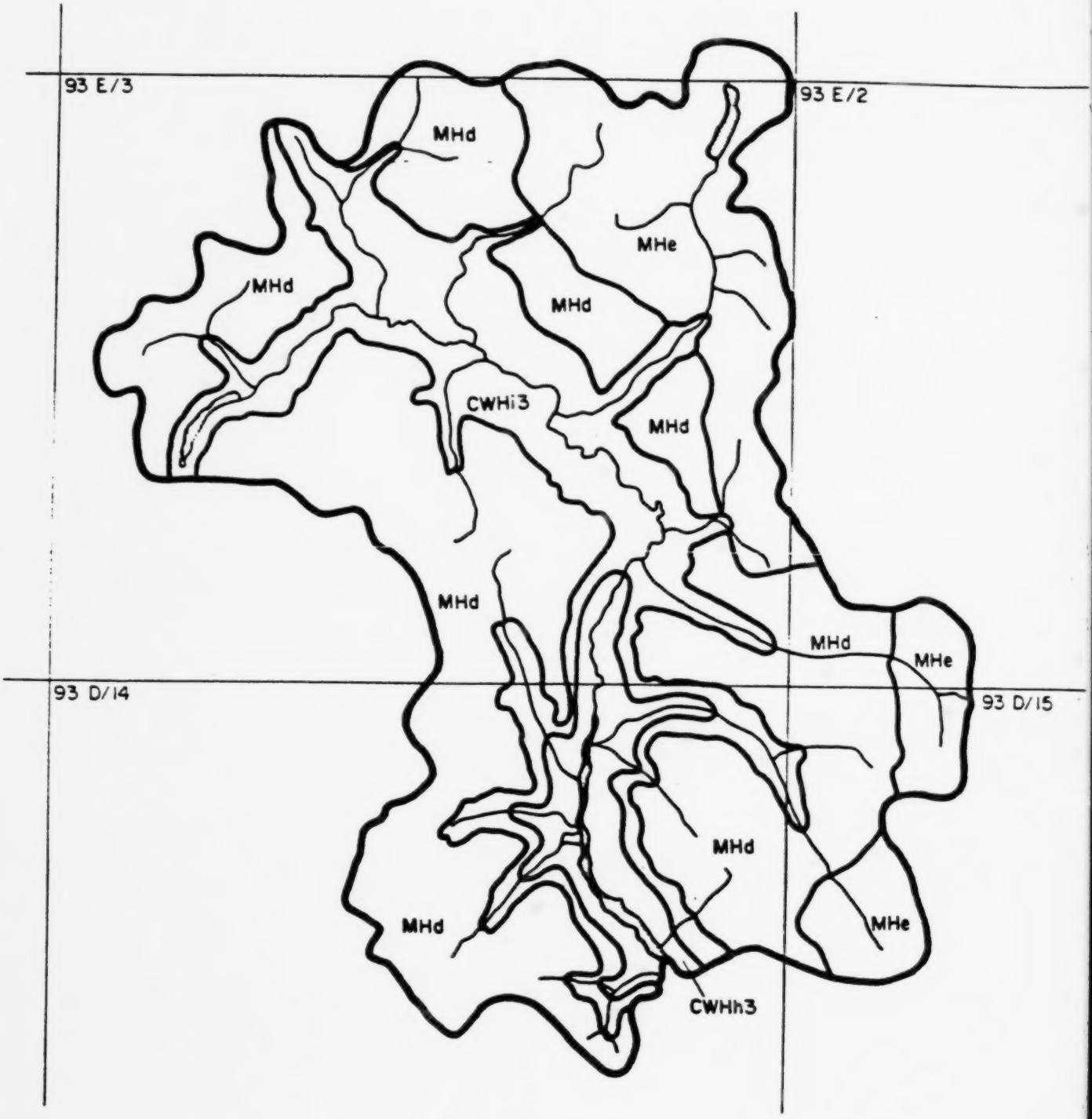


FIGURE 2. BIOGEOCLIMATIC UNITS OF THE KIMSQUIT DRAINAGE

Ecology

Minor disturbances of most sites in the CWHi3 result in young climax vegetation. Catastrophic natural events, such as rock falls, floods, and avalanches do produce a variety of diverse successional stages. Rock falls on steep forested slopes usually produce large block fields with lichens and mosses the dominant cover. These sites will be unvegetated for a prolonged period of time, and will take many years to produce shrub cover and eventually trees. On the floodplain of the Kimsquit River, recently disturbed areas are in a dynamic state. Initial disturbance results in colonization by mosses, lichens, and sparse herbs. Alnus rubra, Populus trichocarpa and Salix sitchensis (Sitka willow) soon become dominant leading to young and maturing seral stands. Climax forests are often dominated by Picea sitchensis. Avalanche tracks, typical of steep-sided mountain valleys, initially are colonized by sparse subalpine type herbs. Over time these sites may be dominated by thick vigorous herb layers or a continuous cover of shrubs.

MH - MOUNTAIN HEMLOCK ZONE

The Mountain Hemlock zone occurs throughout the drainage above the CWHi3 variant. The MHd and MHdp subzones occupy most of the area with the MHe and MHep subzones confined to the eastern portion of the study area. Upper limits of the MH zone have not been determined, although the zone extends to approximately 1200 m.

MHd - Mountain Hemlock Zone; Coastal Forested Subzone

1. General Description

The MHd subzone begins at 760 m on north and east aspects and at 910 m on south and west aspects. Cold air drainage in mountain valleys brings the subzone down to 605 m.

The climate is colder than the CWHi3 with considerably more snowfall. Colluvium and exposed bedrock are dominant parent materials. Orthic Ferro Humic Podzols and Orthic Humo Ferric Podzols are the dominant soils.

2. Vegetation

Tsuga mertensiana (Mountain hemlock) and Abies amabilis are the dominant climax tree species. Chamaecyparis nootkatensis (Yellow cedar) and Abies lasiocarpa (Subalpine fir) are rare. Tsuga heterophylla occurs sporadically along the lower limits of the subzone. Vaccinium alaskaense and Vaccinium ovalifolium dominate the usually continuous shrub layer, although Vaccinium alaskaense may not always be present. Vaccinium membranaceum (Black blueberry) is also a common shrub. Although sporadically occurring, Cladothamnus pyroliflorus (Copperbush) may be locally abundant at higher elevations. Common in the sparse herb layer are Rubus pedatus and Cornus unalaschkensis. The moss layer is dominated by Rhytidiopsis robusta and Dicranum spp. Rhytidiadelphus loreus occurs sporadically.

3. Ecology

On most sites within the MHd, disturbance results in a return to young climax vegetation in a relatively short time. Exceptions to this occur on areas of rock fall and avalanche tracks. In the high steep-sided mountain valleys, typical of this subzone, these two processes maintain much of the vegetation in a pioneer seral or disclimax state. Areas of rock fall or mass movement are colonized by lichens and mosses and may never return to a normal vegetated condition. The harsh climate is a major limiting factor to ecological succession and productivity. In terms of biomass production the avalanche tracks often exceed all other sites within the subzone. Initially, after disturbance, subalpine and alpine herbs take root. Within a few years, organic matter has accumulated on the soil surface and vegetative cover may be nearly entire. It is not clear what factors act to produce herb- or shrub-dominated avalanche tracks. Intensity of disturbance (amount of snow, weight, speed), time of year, elevation, and aspect are just some of the factors interacting. In general, the herb- and shrub-dominated sites are very productive exhibiting high organic buildup in soil surface layers, usually with active seepage.

MHdp - Mountain Hemlock Zone; Coastal Parkland Subzone

1. General Description

The MHdp subzone is variable in its elevational extent (above 850 m) and occurs as scattered units above the MHd where conditions are suitable. Parkland forests develop on gently sloping to nearly level areas of deep soil where cold air pooling occurs.

In these localized areas, the climate (especially in winter) is severe with very cold temperatures and deep snow accumulation. Relatively deep deposits of moraine with patches of exposed bedrock characterize the parent materials. Orthic Ferro Humic Podzols and Orthic Humo Ferric Podzols are the most common soils.

2. Vegetation

Tsuga mertensiana and Abies amabilis are the most common tree species in the shrub layer (<10 m). Very few trees grow taller than ten metres. The trees present always grow in clumps or "islands" with low cover values. Cladothamnus pyroliflorus may be locally abundant. Other scattered shrubs include Vaccinium membranaceum, Vaccinium ovalifolium and Sorbus scopulina (Mountain-ash). The herb layer is usually dominated by Phyllodoce empetriformis (Mountain-heather) and Cassiope mertensiana (Cassiope). These two species reflect heavy snow accumulation and resultant nivation. Rubus pedatus and Luetkea pectinata (Luetkea) occur sporadically. Cladina spp. dominates the moss, lichen, and liverwort layer.

3. Ecology

More information is required before the ecology of the MHdp subzone can be accurately documented. According to Krajina and Brooke (1970), the development of plant communities in response to snow accumulation and duration is characteristic. Because of the nature of the landforms, major disturbances are

rare. On most sites, disturbance will result in revegetation by climax plant species immediately. The environment is relatively stable and climax conditions on sites may endure for centuries.

MHe and MHep - Mountain Hemlock Zone; Transitional (Subalpine fir - Mountain hemlock) Forested and Transitional (Subalpine fir - Mountain hemlock) Parkland Subzones

1. General Description

The MHe and MHep subzones have developed in response to the transitional nature of the climate along the eastern boundary of the Kimsquit drainage. The eastern boundary, delimited partially by the western edge of Tweedsmuir Provincial Park, coincides with the divide between coastal and interior physiographic regions. As a result, the climate may be somewhat colder and drier than in the MHd and MHdp subzones (as evidenced by the presence of Abies lasiocarpa). Due to limited access only six plots were obtained in these two subzones. Descriptions of environmental conditions, vegetation, and ecology are only preliminary. Because of the lack of data, the subzones have been described together.

In the upper drainages of Smaby, Salahagen, Trapper, Salient, and King George creeks, the MHe occurs above 760 m on north and east aspects and above 910 m on south and west aspects (Figure 2). The MHep subzone occurs above the MHe (above 850 m), although its extent is not known.

Parent materials are basically the same as the MHd and MHdp, with shallow colluvium common on steep slopes and and deep moraine on flatter areas. Exposed bedrock occurs throughout both subzones. Without more soil sampling, definitive statements cannot be made regarding soil development in these subzones.

2. Vegetation

In the MHe, Abies lasiocarpa is the dominant tree species with scattered Tsuga mertensiana and Abies amabilis. Vaccinium membranaceum and Menziesia ferruginea (Menziesia) are common shrubs. Rubus pedatus and Streptopus roseus are characteristic herbs.

The MHep subzone is floristically and structurally similar to the MHdp. The major difference is the replacement of Abies amabilis with Abies lasiocarpa. Lophozia spp. and Cladina spp. are the dominant liverworts and lichens, respectively.

3. Ecology

The ecology of the MHe and MHep can be assumed to be similar to that of the MHd and MHep. Colder temperatures may retard succession to a greater degree but the effect of climate on ecology is probably much alike.

ECOSYSTEM ASSOCIATION DESCRIPTION

FORMAT

In this section, the ecosystem associations are described in terms of ecological characteristics, environmental features, and vegetation. For associations where successional stages have been documented, a separate vegetation description is provided for each stage. The format follows that used in Yole et al. (1982).

The descriptions are organized in the following way:

Ecosystem Unit: refers to the biogeoclimatic unit and number and name of the ecosystem association. Two types of names are used to label each association: a scientific name and a colloquial or common name. The scientific name is typically composed of a dominant plant species in each vegetation layer present. By convention the zonal or mesic ecosystem association is given the number 01, and following associations are ordered from dry to wet. Exceptions to this are avalanche track associations.

Number of Releves: gives the number of plots upon which the description is based. This is in effect a measure of the reliability of the information.

Ecological Moisture Regime: refers to the field assessment of available moisture for plant growth. The classes are as follows: very xeric, xeric, subxeric, submesic, mesic, subhygric, hygric, subhydric, and hydric. For detailed definition of classes, see Yole et al. (1982) or Walmsley et al. (1980).

Ecological Nutrient Regime: refers to the field assessment of available nutrients for plant growth. Classes are as follows: oligotrophic, submesotrophic, mesotrophic, permesotrophic, eutrophic, and hypereutropic. For a detailed description, see Yole et al. (1982) or Walmsley et al. (1980).

Edatopic Grid: the small grid indicates ecological moisture regime (on the vertical axis) and ecological nutrient regime (on the horizontal axis) in a two-way matrix. Shaded areas on grids represent the range of moisture and nutrient regimes for the association described. The letters and numbers on the grid relate to nutrient and moisture regimes as follows:

A - oligotrophic	1 - xeric
B - submesotrophic	2 - subxeric
C - mesotrophic	3 - submesic
D - permesotrophic	4 - mesic
E - subeutrophic to eutrophic	5 - subhygric
	6 - hygric
	7 - subhydric

Environmental Features: summarizes typical site characteristics for each association. This section includes macro slope position, slope range, surface shape, parent materials, and soil development (no detailed description of soils is provided). For definition of terms used, see Walmsley et al. (1980).

Successional Stage: where successional stages have been defined they are described separately (number of releves in brackets), each with a separate vegetation decription.

Vegetation: in this part, the dominant or characteristic plants for each association are listed. The structure of each layer is described and scientific and common names of plants (adapted from Taylor and MacBryde 1977) are listed. Complete scientific and common plant names are provided in Appendix C.

The plants are described within vegetation layers or strata as follows:

Tree layer - plants having a "tree" growth form and greater than 10 m tall.
Shrub layer - contains woody plants (including trees) between 30 cm and 10 m.
Herb layer - includes all non-woody herbaceous vascular plants and dwarf shrubs (<30 cm).
Moss layer - the "moss layer" includes all mosses, lichens, and liverworts growing on the forest floor.

Within each layer, the plant species are listed in order of importance or dominance. Characteristic plants are those occurring in 75% or more of sampled plots with relatively high cover values (cover refers to the estimated percentage of ground surface covered by a plant species). Associated plants (in brackets) are those occurring in 50-74% of plots with relatively high cover values or >75% of plots with low cover values. For a complete description of plants and associated cover values see Appendix A.

ECOSYSTEM ASSOCIATIONS OF THE CWHi3

ECOSYSTEM ASSOCIATIONS

01 Zonal Western hemlock - Amabilis fir - Vaccinium - moss

02 Submesic Western hemlock - (Amabilis fir - Vaccinium) - moss

03 Moist hemlock - Amabilis fir - Vaccinium - fern[1]

04 Lady fern[1]

05 Devil's-club - fern - leafy moss

06 Floodplain spruce - Devil's-club

07 Skunk cabbage

08 Sitka mountain alder - Lady fern avalanche track

09 Sedge fen

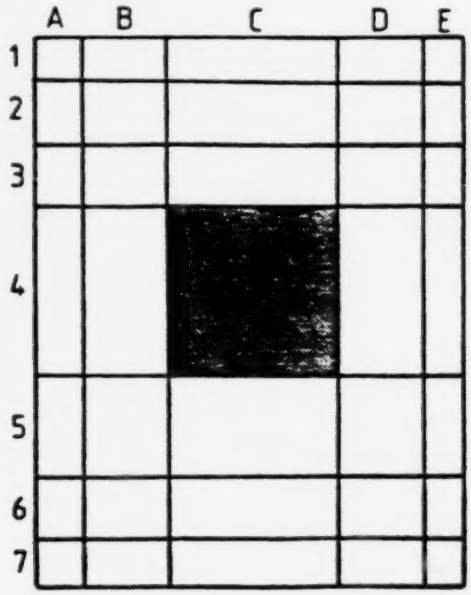
1 Little data exist to support the 03 association and none for the 04 association (described by Yole et al. (1982)). For descriptive and mapping purposes, these two associations have been conglomerated with 05.

CWHi3/02 ZONAL WESTERN HEMLOCK - AMABILIS FIR - VACCINIUM - MOSS

Ecosystem Unit: CWHi3/01
Tsuga heterophylla - Abies amabilis - Vaccinium (alaskaense, ovalifolium) - Cornus unalaschkensis - Rhytidiadelphus loreus - Hylocomium splendens - Rhytidiopsis robusta
Zonal Western hemlock - Amabilis fir - Vaccinium - moss ecosystem association

No. of Releves: 19
Ecological Moisture Regime: mesic

Ecological Nutrient Regime: mesotrophic



Environmental Features

Slope Position: commonly mid slope - quite variable
Slope Range: variable (5-65%)
Surface Shape: diverse - various depths of colluvial and morainal material
Soil Development: O.HFP and O.FHP[1]

1 Abbreviations for soil development are from the Canadian System of Soil Classification (Agriculture Canada 1978). For more information on soils in the CWHi3 see Yole et al. (1982).

Successional Stage: Young and mature climatic climax (19)

VEGETATION

Tree Layer: Western hemlock and Amabilis fir dominant; Douglas fir rare and Western red cedar occasional; mean cover 45%.

Tsuga heterophylla	Western hemlock
Abies amabilis	Amabilis fir
(Thuja plicata)	Western red cedar

Shrub Layer: Well-developed; mean cover 60%.

Vaccinium alaskaense	Alaskan blueberry
Vaccinium ovalifolium	Oval-leaved blueberry
Abies amabilis	Amabilis fir
Tsuga heterophylla	Western hemlock
(Menziesia ferruginea)	Menziesia

Herb-layer: Usually sparse, often patchy; mean cover 15%.

Cornus unalaschkensis	Bunchberry
Clintonia uniflora	Bluebead clintonia
Rubus pedatus	Creeping raspberry
(Orthilia secunda)	One-sided wintergreen
(Streptopus roseus)	Simple-stemmed twistedstalk

Moss Layer: Thick, continuous layer; mean cover 65%.

Rhytidiadelphus loreus
Rhytidiopsis robusta
Hylocomium splendens
(Dicranum spp.)

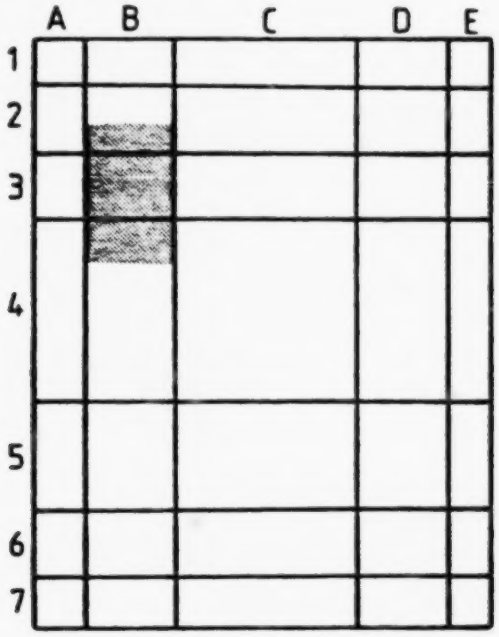
Comments: Most common upland association. This association also occurs in a non-vegetated (talus slopes) state.

CWHi3/02 SUBMESIC WESTERN HEMLOCK - (AMABILIS FIR - VACCINIUM) - MOSS

Ecosystem Unit: CWHi3/02
Tsuga heterophylla - Abies amabilis - (Vaccinium alaskaense) - Rhytidiadelphus loreus - Rhytidiopsis robusta
Submesic Western hemlock - Amabilis fir - (Vaccinium) - moss ecosystem association

No. of Releves: 8

Ecological Moisture Regime: mesic to submesic
Ecological Nutrient Regime: submesotrophic



Environmental Features

Slope Position: upper, ridge tops, knolls (shedding positions)
Slope Range: variable, often steep
Surface Shape: convex
Parent Materials: colluvial and organic veneers over rock, rock slopes and rock hummocks
Soil Development: TY.FO, O.HFP

Successional Stage: Mature edaphic climax (8)

VEGETATION

Tree Layer: Variable, often open canopy; Western hemlock dominant; mean cover 40%.

Tsuga heterophylla	Western hemlock
(Pseudotsuga menziesii)	Douglas fir
(Thuja plicata)	Western red cedar

Shrub Layer: Variable; from well-developed to sparse; mean cover 35%.

Vaccinium alaskaense	Alaskan blueberry
Tsuga heterophylla	Western hemlock
(Menziesia ferruginea)	Menziesia
(Vaccinium parvifolium)	Red huckleberry
(Vaccinium membranaceum)	Black blueberry
(Thuja plicata)	Western red cedar
(Abies amabilis)	Amabilis fir

Herb Layer: Very sparse; low diversity; mean cover 8%.

Cornus unalaschkensis	Bunchberry
(Clintonia uniflora)	Bluebead clintonia
(Orthilia secunda)	One-sided wintergreen
(Goodyera oblongifolia)	Rattlesnake orchid

Moss Layer: Thick, continuous layer; mean cover 70%.

Rhytidiopsis robusta
Rhytidiadelphus loreus
Hylocomium splendens
(Dicranum spp.)

Comments: Low productivity, exposed sites with rapid drainage. This association also occurs in a non-vegetated stage (talus slopes).

CWHi3/03 MOIST WESTERN HEMLOCK - AMABILIS FIR - VACCINIUM - FERN

Ecosystem Unit: CWHi3/03

Tsuga heterophylla - *Abies amabilis* - *Vaccinium alaskaense* - *Dryopteris assimilis* - *Gymnocarpium dryopteris* - (*Rhytidiadelphus loreus*)

Moist Western hemlock - Amabilis fir - *Vaccinium* - fern ecosystem association

Included in description with CWHi3/03

CWHi3/04 LADY FERN

Ecosystem Unit: CWHi3/04

Athyrium filix-femina

Lady fern ecosystem association

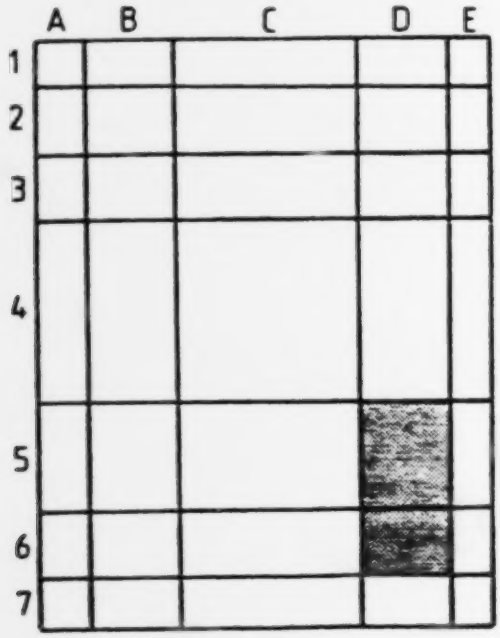
Included in description with CWHi3/03.

CWHi3/05 DEVIL'S-CLUB - FERN - LEAFY MOSS

Ecosystem Unit: CWHi3/05
Tsuga heterophylla - Abies amabilis - Oplopanax horridus - Gymnocarpium dryopteris - Mnium spp.
Devil's-club - fern - leafy moss ecosystem association.

No. of Releves: 9

Ecological Moisture Regime: subhygric to hygric
Ecological Nutrient Regime: permesotrophic



Environmental Features

Slope Position: lower and middle slopes
Slope Range: gentle to steep slopes
Surface Shape: concave (receiving)
Parent Materials: gullied colluvial and morainal blankets, gullied fluvial.
Soil Development: O.R, O.H.G., O.FHP

Comments: This association is often found in gully positions with seepage waters present.

Successional Stage: Mature edaphic climax (7)

VEGETATION

Tree Layer: Highly variable; often sparse or lacking; mean cover 30%

(Tsuga heterophylla)	Western hemlock
(Abies amabilis)	Amabilis fir

Shrub Layer: Well-developed, often continuous; mean cover 60%

Oplopanax horridus	Devil's-club
Rubus spectabilis	Salmonberry
(Vaccinium alaskaense)	Alaskan blueberry
(Tsuga heterophylla)	Western hemlock
(Abies amabilis)	Amabilis fir

Herb Layer: Often well-developed, lush, diverse; mean cover 45%

Gymnocarpium dryopteris	Oak fern
Tiarella unifoliata	Foamflower
(Streptopus roseus)	Simple-stemmed twistedstalk
(Athyrium filix-femina)	Lady fern
(Dryopteris assimilis)	Spiny shield fern
(Rubus pedatus)	Creeping raspberry
(Streptopus amplexifolius)	Cucumberroot twistedstalk

Moss Layer: Variable, usually continuous; mean cover 60%

Mnium glabrescens
(Brachythecium spp.)
(Rhytidiadelphus loreus)

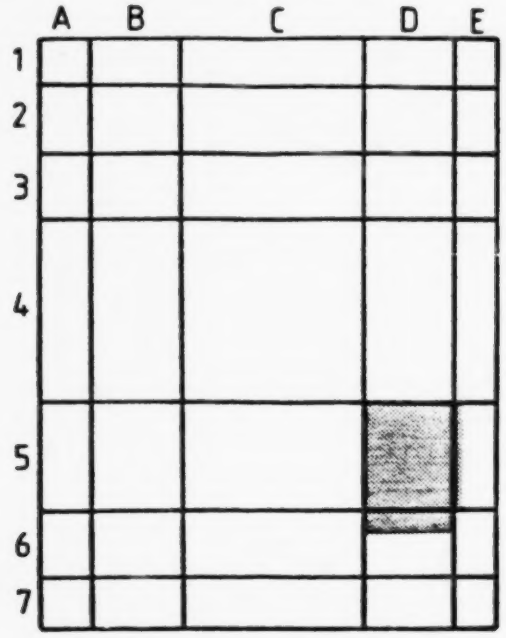
Comments: This association also occurs in a pioneer seral (lacks trees, more vigorous shrub and herb layers) and young edaphic climax (very similar structure and composition) stage.

CWHi3/06 FLOODPLAIN SPRUCE - DEVIL'S-CLUB - FERN

Ecosystem Unit: CWHi3/06
Picea sitchensis - *Tsuga heterophylla* - *Oplopanax horridus* - *Gymnocarpium dryopteris* - *Mnium* spp.
Floodplain spruce - Devil's-club - fern ecosystem association

No. of Releves: 14

Ecological Moisture Regime: subhygric
Ecological Nutrient Regime: permesotrophic



Environmental Features

Slope Position: level, valley floor
Slope Range: level-10%
Surface Shape: straight (flat), gently sloping
Parent Materials: fluvial level, fluvial terraces, fluvial fans

Comments: Active channelling often present on fan and floodplain units.

Successional Stage: Pioneer seral - grass-forb and shrub-seedling (3)

VEGETATION

Tree Layer: completely lacking

Shrub Layer: variable from sparse to continuous; mean cover 55%

Alnus rubra	Red alder
Populus trichocarpa	Black cottonwood
(Alnus sinuata)	Sitka mountain alder
(Salix sitchensis)	Sitka willow
(Picea sitchensis)	Sitka spruce

Herb Layer: usually sparse, composed of colonizing plants; mean cover 2%

(Carex spp.)	Sedges
(Epilobium latifolium)	Broad-leaved willowherb
(Elymus glaucus)	Wild rye grass

Moss Layer: variable, from sparse to continuous; mean cover 73%

Rhacomitrium spp.
Polytrichum juniperinum
(Cladonia spp.)
(Cladina spp.)
(Stereocaulon spp.)

Successional Stage: Maturing seral (4)

VEGETATION

Tree Layer: Variable from patchy to well-developed; mean cover 35%

Alnus rubra	Red alder
Populus trichocarpa	Black cottonwood
(Picea sitchensis)	Stika spruce

Shrub Layer: Diverse, well-developed from patchy to continuous; mean cover 67%

Alnus rubra	Red alder
Rubus spectabilis	Salmonberry
Picea sitchensis	Sitka spruce
Oplopanax horridus	Devil's-club
(Tsuga heterophylla)	Western hemlock
(Ribes bracteosum)	Stink currant
(Sambucus racemosa)	Elderberry

Herb Layer: Sparse, diverse; mean cover 13%

(Gymnocarpium dryopteris)	Oak fern
(Aruncus sylvester)	Goat's-beard
(Dryopteris assimilis)	Spiny shield fern
(Orthilia secunda)	One-sided wintergreen
(Athyrium filix-femina)	Lady fern

Moss Layer: Poorly developed, very sparse; mean cover 7%

(Brachythecium spp.)
(Mnium spp.)

Successional Stage: Mature edaphic climax (6)

VEGETATION

Tree Layer: Variable, from open to continuous canopy; mean cover 40%

Picea sitchensis	Sitka spruce
Abies amabilis	Amabilis fir
(Tsuga heterophylla)	Western hemlock

Shrub Layer: Usually patchy, diverse; mean cover 48%

Tsuga heterophylla	Western hemlock
Vaccinium ovalifolium	Oval-leaved blueberry
(Oplopanax horridus)	Devil's-club
(Abies amabilis)	Amabilis fir
(Viburnum edule)	High-bush cranberry
(Rubus spectabilis)	Salmonberry

Herb Layer: Sparse to well-developed, diverse; mean cover 25%

Streptopus roseus	Simple-stemmed twisted-stalk
(Orthilia secunda)	One-sided wintergreen
(Gymnocarpium dryopteris)	Oak fern
(Tiarella unifoliata)	Foamflower
(Lycopodium clavatum)	Running club-moss

Moss Layer: Variable from sparse to well-developed; mean cover 40%

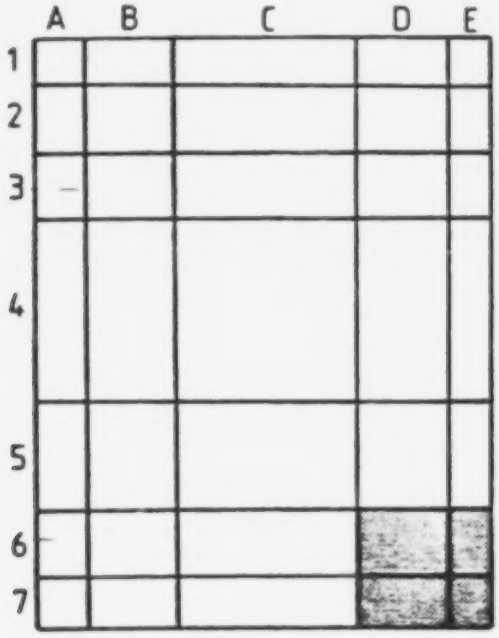
(Brachythecium spp.)
(Mnium spp.)
(Rhytidiadelphus loreus)

CWHi3/07 SKUNK-CABBAGE

Ecosystem Unit: CWHi3/07
Cornus sericea - *Lysichiton americanum* - *Athyrium filix-femina* - *Mnium* spp.
Skunk-cabbage ecosystem association

No. of Releves: 3

Ecological Moisture Regime: hygric to subhydric
Ecological Nutrient Regime: permesotrophic to eutrophic



Environmental Features

Slope Position: lower and middle slopes
Slope Range: nearly level (0-5%)
Surface Shape: straight (flat)
Parent Materials: fluvial and organic veneers
Soil Development: O.HG

Comments: Fluvial deposits or small infilled depressions on slopes.

Successional Stage: Mature edaphic climax (3)

VEGETATION

Tree Layer: Trees usually lacking

Shrub Layer: Patchy, often locally thick; mean cover 40%

Cornus sericea	Red-osier dogwood
Oplopanax horridus	Devil's-club
(Rubus spectabilis)	Salmonberry
(Ribes bracteosum)	Stink currant

Herb Layer: Well-developed, continuous, vigorous; mean cover 85%

(Athyrium filix-femina)	Lady fern
Lysichiton americanum	Skunk-cabbage
Streptopus roseus	Simple-stemmed twistedstalk
(Gymnocarpium dryopteris)	Oak fern
(Tiarella unifoliata)	Foamflower
(Streptopus amplexifolius)	Cucumberroot twistedstalk

Moss Layer: Continuous, well-developed; mean cover 75%

Mnium spp.
(Brachythecium spp.)
(Conocephalum conicum)
(Sphagnum spp.)

Comments: Although this association occurs as a mature edaphic climax, it has also been mapped as a pioneer seral-shrub stage (because of the lack of trees).

CWHi3/08 SITKA MOUNTAIN ALDER - LADY FERN AVALANCHE TRACK

Ecosystem Unit: CWHi3/08

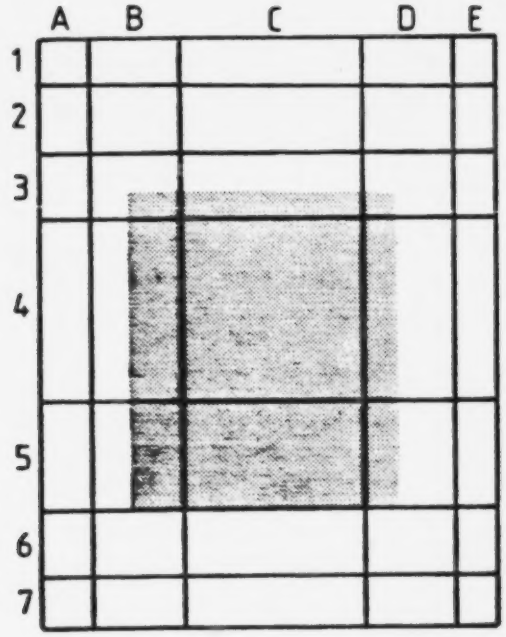
Alnus sinuata - Rubus spectabilis - Athyrium filix-femina - Veratrum viride

Sitka mountain alder - Lady fern avalanche track ecosystem association

No. of Releves: 19

Ecological Moisture Regime: submesic to subhygric

Ecological Nutrient Regime: submesotrophic to permesotrophic



Environmental Features

Slope Position: valley floor, lower to supper slopes

Slope Range: steep to very steep (30-80%)

Surface Shape: straight

Parent Materials: actively avalanching colluvial slopes and colluvial fans

Soil Development: O.R, O.DYB, O.SB

Comments: The non-vegetated stage has a drier moisture regime (submesic to mesic) and poorer nutrient regime (submesotrophic to mesotrophic).

Successional Stage: Pioneer seral - non-vegetated (4)

VEGETATION

Tree Layer: Completely lacking

Shrub Layer: Very sparse, individuals; mean cover 2%

(*Salix sitchensis*)	Sitka willow
(*Alnus sinuata*)	Sitka mountain alder

Herb Layer: Sparse patchy, colonizing plants; mean cover 10%

(*Oxyria digyna*)	Mountain sorrel
(*Aruncus sylvester*)	Goat's-beard
(*Epilobium latifolium*)	Broad-leaved willowherb
(*Aquilegia formosa*)	Sitka columbine
(*Romanzoffia sitchensis*)	Sitka romanzoffia
(*Achillea millefolium*)	Yarrow
(*Poa* spp.)	Blue grasses

Moss Layer: Very patchy, often lacking; mean cover 3%

(*Rhacomitrium* spp.)

Successional Stage: Pioneer seral - grass-forb (7)

VEGETATION

Tree Layer: Completely lacking

Shrub Layer: Variable, usually patchy; mean cover 25%

(*Sambucus racemosa*)	Elderberry
(*Rubus spectabilis*)	Salmonberry
(*Alnus sinuata*)	Sitka mountain alder

Herb Layer: Continuous, thick, very vigorous; mean cover 85%

Athyrium filix-femina	Lady fern
Aruncus sylvester	Goat's-beard
Veratrum viride	False hellebore
(*Epilobium angustifolium*)	Fireweed
(*Valeriana sitchensis*)	Sitka valerian
(*Dryopteris filix-mas*)	Male fern
(*Pteridium aquilinum*)	Bracken

Moss Layer: Sparse, often lacking; mean cover 9%

(*Mnium insigne*)
(*Brachythecium* spp.)

Comments: This stage may actually be a disclimax; it has been defined as pioneer seral - grass-forb for ease of mapping. High biomass production.

Successional Stage: Pioneer seral - shrub-seedling (8)

VEGETATION

Tree Layer: Completely lacking

Shrub Layer: Very well-developed, continuous, vigorous; mean cover 97%

Alnus sinuata	Sitka mountain alder
Rubus spectabilis	Salmonberry
Sambucus racemosa	Elderberry
(Oplopanax horridus)	Devil's-club
(Cornus sericea)	Red-osier dogwood
(Ribes bracteosum)	Stink currant
(Salix sitchensis)	Sitka willow

Herb Layer: Patchy, vigorous; mean cover 40%

(Athyrium filix-femina)	Lady fern
(Streptopus roseus)	Simple-stemmed twistedstalk
(Gymnocarpium dryopteris)	Oak fern
(Dryopteris filix-mas)	Male fern

Moss Layer: Variable, sparse to continuous; mean cover 20%

(Mnium spp.)
(Brachythecium spp.)

Comments: This stage may actually be a disclimax; it has been defined as pioneer seral - shrub-seedling for ease of mapping. High biomass production.

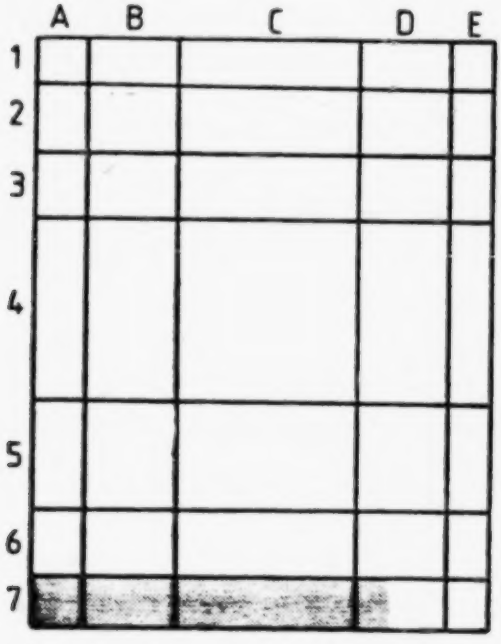
CWHi3/09 SEDGE FEN

Ecosystem Unit: CWHi3/09

Carex spp. - Menyanthes trifoliata - Sphagnum spp.
Sedge fen ecosystem association

No. of Releves: 2

Ecological Moisture Regime: subhydric
Ecological Nutrient Regime: oligotrophic to permesotrophic



Environmental Features

Slope Position: valley floor
Slope Range: level
Surface Shape: straight (flat)
Parent Materials: organic blankets and organic level
Soil Development: TY.F, TY.M

Comments: Very few plots, confined to upper Kimsquit River valley and margins of some lakes.

Successional Stage: Mature edaphic climax (2)

VEGETATION

Tree Layer: Usually lacking although occasional large Sitka spruce may occur.

Shrub Layer: Sparse, patchy; mean cover 6%

(*Spiraea douglasii*)	Hardhack
(*Tsuga mertensiana*)	Mountain hemlock
(*Picea sitchensis*)	Sitka spruce

Herb Layer: Variable from sparse to continuous; mean cover 50%

Carex spp.	Sedges
Menyanthes trifoliata	Buckbean
(*Drosera rotundifolia*)	Sundew
(*Potentilla palustris*)	Marsh cinquefoil

Moss Layer: Variable from patchy to continuous; mean cover 60%

Sphagnum spp.

Comments: This association may be mapped as pioneer seral - grass-forb, to represent the herb dominant cover or as mature climax in areas where trees occur.

ECOSYSTEM ASSOCIATIONS OF THE MHd

ECOSYSTEM ASSOCIATIONS

01 Zonal Mountain hemlock - Vaccinium - moss

02 Submesic Mountain hemlock - moss

03 Subhygric Mountain hemlock - Lady fern - Sitka valerian

04 Sedge - Sphagnum wetland

05 Sitka mountain alder - Willow - Sitka valerian avalanche track

MHd/01 ZONAL MOUNTAIN HEMLOCK - VACCINIUM - MOSS

Ecosystem Unit: MHd/01

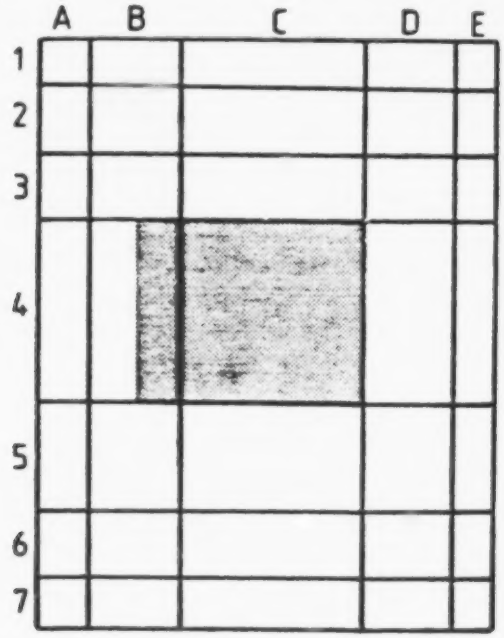
Tsuga mertensiana - (*Abies amabilis*) - *Vaccinium* (*ovalifolium*, *membranaceum*, *alaskaense*) - *Rubus pedatus* - *Rhytidiopsis robusta* - *Dicranum* spp.

Zonal Mountain hemlock - *Vaccinium* - moss ecosystem association

No. of Releves: 15

Ecological Moisture Regime: mesic

Ecological Nutrient Regime: submesotrophic to mesotrophic



Environmental Features

Slope Position: middle slope

Slope Range: moderately steep to steep (20-75%)

Surface Shape: straight

Parent Materials: colluvial and morainal blankets, colluvial and morainal veneers over rock

Soil Development: O.FHP, O.HFP

Successional Stage: Young and mature climatic climax (15)

VEGETATION

Tree Layer: Well-developed, open; mean cover 35%

Tsuga mertensiana	Mountain hemlock
(Abies amabilis)	Amabilis fir
(Tsuga heterophylla)	Western hemlock

Shrub Layer: Well-developed, often continuous; mean cover 65%

Vaccinium ovalifolium	Oval-leaved blueberry
Vaccinium membranaceum	Black blueberry
Tsuga mertensiana	Mountain hemlock
Abies amabilis	Amabilis fir
(Vaccinium alaskaense)	Alaskan blueberry
(Cladothamnus pyroliflorus)	Copperbush
(Menziesia ferruginea)	Menziesia

Herb Layer: Usually sparse, poorly developed; mean cover 15%

Rubus pedatus	Creeping raspberry
(Cornus unalaschkensis)	Bunchberry
(Streptopus roseus)	Simple-stemmed twistedstalk

Moss Layer: Well-developed, often continuous; mean cover 60%

Rhytidiopsis robusta
Dicranum spp.
(Rhytidiadelphus loreus)
(Pleurozium schreberi)

Comments: Young climax units may have all tree species confined to the shrub layer. Cover values for shrubs may be significantly lower.

MHd/02 SUBMESIC MOUNTAIN HEMLOCK - MOSS

Ecosystem Unit: MHd/02

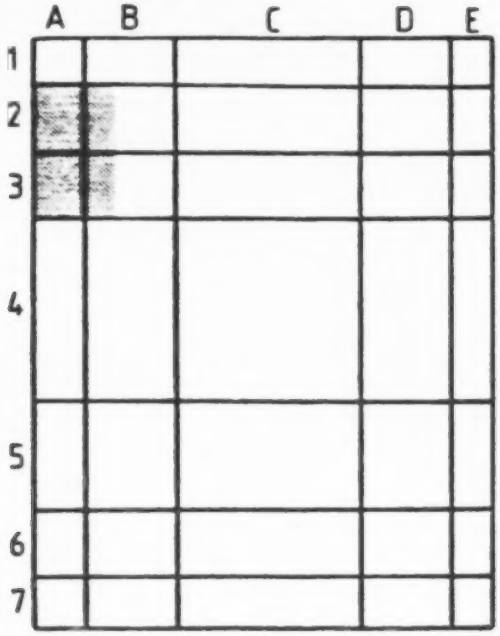
Tsuga mertensiana - (Abies amabilis) - (Menziesia ferruginea) - Rhytidiopsis robusta - (Cladina spp.)

Submesic Mountain hemlock - moss ecosystem association

No. of Releves: 2

Ecological Moisture Regime: subxeric to submesic

Ecological Nutrient Regime: oligotrophic



Environmental Features

Slope Position: crest and upper slope

Slope Range: gentle to very steep (10-100%)

Surface Shape: convex to straight

Parent Materials: rock steep and colluvial veneers over rock

Soil Development: not documented

Comments: Requires more data to accurately document.

Successional Stage: Young and mature edaphic climax (2)

VEGETATION

Tree Layer: Sparse, very open; mean cover 12%

Tsuga mertensiana	Mountain hemlock

Shrub Layer: Variable, sparse to well developed; mean cover 35%

Abies amabilis	Amabilis fir
Tsuga mertensiana	Mountain hemlock
(Chamaecyparis nootkatensis)	Yellow cedar
(Tsuga heterophylla)	Western hemlock
(Menziesia ferruginea)	Menziesia
(Vaccinium ovalifolium)	Oval-leaved blueberry
(Vaccinium alaskaense)	Alaskan blueberry

Herb Layer: Virtually lacking; mean cover .5%

(Cryptogramma crispa)	Parsley fern
(Phyllodoce empetriformis)	Mountain heather

Moss Layer: Diverse, variable; mean cover 50%

(Rhytidiopsis robusta)
(Rhytidiadelphus loreus)
(Cladina spp.)
(Cladonia spp.)

Comments: This association also occurs in a non-vegetated stage (talus slopes) and a disclimax stage (high elevation scrub forests).

MDd/03 SUBHYGRIC MOUNTAIN HEMLOCK - LADY FERN - SITKA VALERIAN

Ecosystem Unit: MHd/03

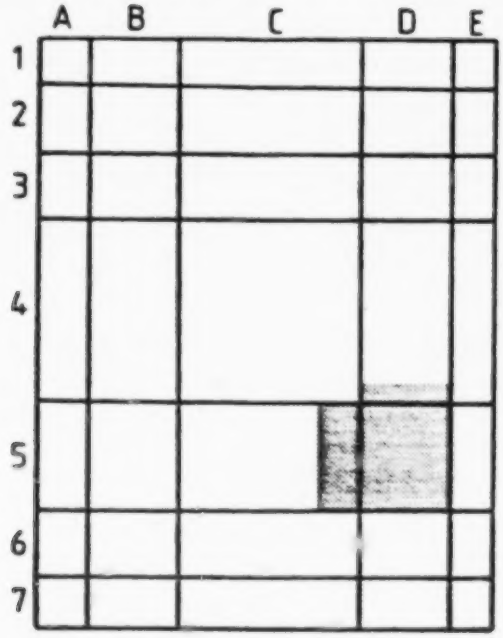
Tsuga mertensiana - (*Vaccinium ovalifolium*) - *Athyrium filix-femina* - *Valeriana sitchensis* - *Dicranum* spp.

Subhygric Mountain hemlock - Lady fern - Sitka valerian ecosystem association.

No. of Releves: 2

Ecological Moisture Regime: subhygric

Ecological Nutrient Regime: permesotrophic



Environmental Features

Slope Position: middle and lower slopes

Slope Range: steep (45-65%)

Surface Shape: straight

Parent Materials: colluvial blankets and colluvial veneers over rock

Soil Development: not documented; soils subject to subsurface seepage

Comments: Requires more data to accurately document.

Successional Stage: Young and mature edaphic climax (2)

VEGETATION

Tree Layer: Usually lacking

Shrub Layer: Usually open and patchy; mean cover 27%

Tsuga mertensiana	Mountain hemlock
(Abies amabilis)	Amabilis fir
(Vaccinium ovalifolium)	Oval-leaved blueberry
(Sorbus scopulina)	Mountain-ash
(Oplopanax horridus)	Devil's-club

Herb Layer: Moderately well-developed, patchy; mean cover 50%

Athyrium filix-femina	Lady fern
Valeriana sitchensis	Sitka valerian
Streptopus roseus	Simple-stemmed twistedstalk
Gymnocarpium dryopteris	Oak fern
(Tiarella unifoliata)	Foamflower
(Viola glabella)	Yellow wood violet

Moss Layer: Variable from sparse to well-developed; mean cover 35%

(Dicranum spp.)
(Lophozia spp.)
(Rhytidiadelphus loreus)
(Mnium glabrescens)

MHd/04 SEDGE - SPHAGNUM WETLAND

Ecosystem Unit: MHd/04

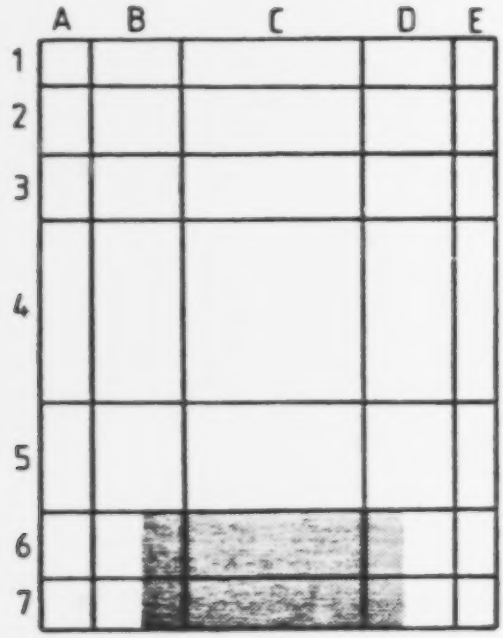
Carex spp. - (Sanguisorba canadensis - Platanthera spp.) - Sphagnum spp.

Sedge - Sphagnum wetland ecosystem association

No. of Releves: 2

Ecological Moisture Regime: hygric to subhydric

Ecological Nutrient Regime: submesotrophic to permesotrophic



Environmental Features

Slope Position: valley floor, slope level

Slope Range: 0-5%

Surface Shape: straight (flat)

Parent Materials: organic blankets

Soil Development: TY.F

Successional Stage: Mature edaphic climax (2)

VEGETATION

Tree Layer: Usually lacking or very sparse; mean cover 2%

(*Tsuga mertensiana*)	Mountain hemlock
(*Chamaecyparis nootkatensis*)	Yellow cedar

Shrub Layer: Sparse or lacking; mean cover 10%

(*Chamaecyparis nootkatensis*)	Yellow cedar
(*Tsuga mertensiana*)	Mountain hemlock
(*Vaccinium membranaceum*)	Black blueberry
(*Cladothamnus pyroliflorus*)	Copperbush

Herb Layer: Continuous low cover; mean cover 70%

Carex spp.	Sedges
(*Sanguisorba canadensis*)	Sitka burnet
(*Platanthera* spp.)	Rein orchids
(*Lysichiton americanum*)	Skunk-cabbage
(*Leptarrhena pyrolifolia*)	Leatherleaf saxifrage

Moss Layer: Continuous Sphagnum; mean cover 70%

Sphagnum spp.

Comments: Also mapped as pioneer seral - grass-forb stage.

MHd/05 SITKA MOUNTAIN ALDER - WILLOW - SITKA VALERIAN AVALANCHE TRACK

Ecosystem Unit: MDd/05

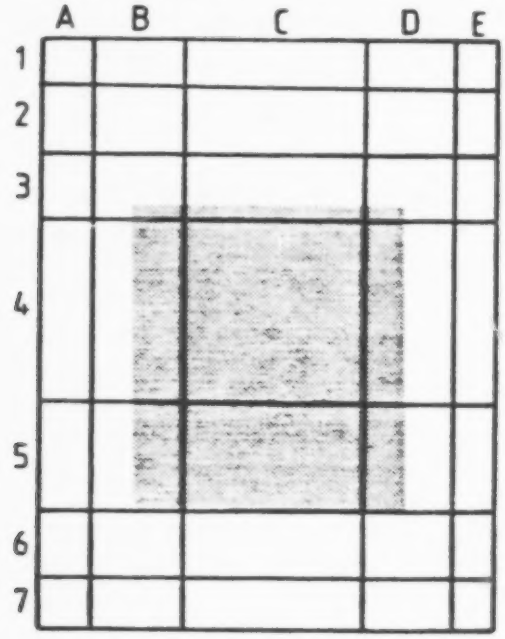
Alnus sinuata - Salix spp. - Valeriana sitchensis - (Athyrium filix-femina) - (Mnium insigne - Brachythecium spp.)

Sitka mountain alder - Willow - Sitka valerian avalanche track ecosystem association

No. of Releves: 13

Ecological Moisture Regime: submesic to subhygric

Ecological Nutrient Regime: submesotrophic to permesotrophic



Environmental Features

Slope Position: valley floor, lower to upper slopes

Slope Range: gentle to very steep (20-60%)

Surface Shape: straight

Parent Materials: actively avalanching colluvial slopes and fans

Soil Development: O.R, O.DYB

Comments: The non-vegetated stage has a drier moisture regime (submesic to mesic) and poorer nutrient regime (submesotrophic to mesotrophic).

Successional Stage: Pioneer seral - non-vegetated (2)

VEGETATION

Tree Layer: Completely lacking

Shrub Layer: Very sparse; mean cover 3%

(Salix barclayi)	Barclay's willow
(Alnus sinuata)	Sitka mountain alder
(Tsuga mertensiana)	Mountain hemlock

Herb Layer: Sparse to patchy; mean cover 50%

(Valeriana sitchensis)	Sitka valerian
(Phyllodoce empetriformis)	Mountain heather
(Epilobium spp.)	Willowherbs
(Vahlodea atropurpurea)	Mountain vahlodea
(Luetkea pectinata)	Luetkea

Moss Layer: Sparse or lacking; mean cover 20%

(Dicranum spp.)
(Rhacomitrium spp.)

Successional Stage: Pioneer seral - grass-forb (5)

VEGETATION

Tree Layer: Completely lacking

Shrub Layer: Sparse and patchy; mean cover 13%

(*Rubus spectabilis*)	Salmonberry
(*Sorbus scopulina*)	Mountain-ash
(*Alnus sinuata*)	Sitka mountain alder

Herb Layer: Diverse, continuous and vigorous; mean cover 95%

Valeriana sitchensis	Sitka valerian
Senecio triangularis	Arrow-leaved ragwort
(*Veratrum viride*)	False hellebore
(*Athyrium filix-femina*)	Lady fern
(*Carex* spp.)	Sedges
(*Heracleum sphondylium*)	Cow-parsnip
(*Aruncus sylvester*)	Goat's-beard

Moss Layer: Lacking or sparse, mean cover 25%

(*Brachythecium* spp.)
(*Mnium insigne*)

Comments: This stage may be a disclimax; it is defined as a pioneer seral - grass-forb for ease of mapping. High biomass production.

Successional Stage: Pioneer seral - shrub-seedling (6)

VEGETATION

Tree Layer: Completely lacking

Shrub Layer: Thick, continuous, vigorous; mean cover 80%

Alnus sinuata	Sitka mountain alder
Salix spp.	Willows
(Oplopanax horridus)	Devil's-club

Herb Layer: Moderately well-developed, vigorous; mean cover 50%

Valeriana sitchensis	Sitka valerian
(Athyrium filix-femina)	Lady fern
(Vahlodea atropurpurea)	Mountain vahlodea
(Tiarella unifoliata)	Foamflower
(Streptopus roseus)	Simple-stemmed twistedstalk

Moss Layer: Lacking or sparse; mean cover 13%

(Brachythecium spp.)
(Mnium insigne)

Comments: This stage may be a disclimax; it is defined as pioneer seral - shrub-seedling for ease of mapping. High biomass production.

ECOSYSTEM ASSOCIATIONS OF THE MHdp

ECOSYSTEM ASSOCIATIONS

01 Zonal Mountain hemlock - Cassiope - Cladina

02 Submesic Mountain heather - Cassiope

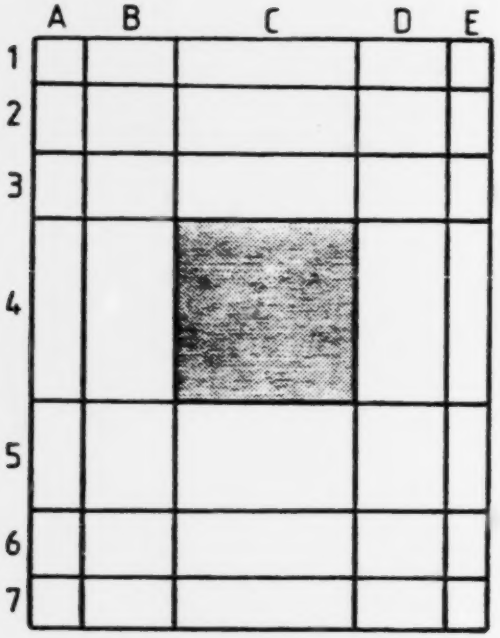
03 Subhygric Copperbush - Sitka valerian - Sphagnum

MHdp/01 ZONAL MOUNTAIN HEMLOCK - CASSIOPE - CLADINA

Ecosystem Unit: MHdp/01
Tsuga mertensiana - (Cladothamnus pyroliflorus) - Cassiope mertensiana - Phyllodoce empetriformis - Cladina spp.
Mountain hemlock - Cassiope - Cladina ecosystem association

No. of Releves: 3

Ecological Moisture Regime: mesic
Ecological Nutrient Regime: mesotrophic



Environmental Features

Slope Position: upper slope
Slope Range: gentle (10-25%)
Surface Shape: variable
Parent Materials: colluvial and morainal blankets, morainal veneers over rock
Soil Development: O.HFP

Successional Stage: Young and mature climatic climax (3)

VEGETATION

Tree Layer: Usually lacking; mean cover 2%

(Tsuga mertensiana)	Mountain hemlock

Shrub Layer: Sparse to well-developed; mean cover 33%

Tsuga mertensiana	Mountain hemlock
(Cladothamnus pyroliflorus)	Copperbush
(Abies amabilis)	Amabilis fir
(Sorbus scopulina)	Mountain-ash
(Vaccinium ovalifolium)	Oval-leaved blueberry

Herb Layer:

Cassiope mertensiana	Cassiope
Phyllodoce empetriformis	Mountain heather
(Rubus pedatus)	Creeping raspberry
(Luetkea pectinata)	Luetkea

Moss Layer: Well-devloped, lichens and liverworts dominant; mean cover 60%

Cladina spp.
(Lophozia spp.)
(Pleurozium schreberi)
(Dicranum spp.)
(Rhytidiopsis robusta)

MHdp/02 SUBMESIC MOUNTAIN HEATHER - CASSIOPE

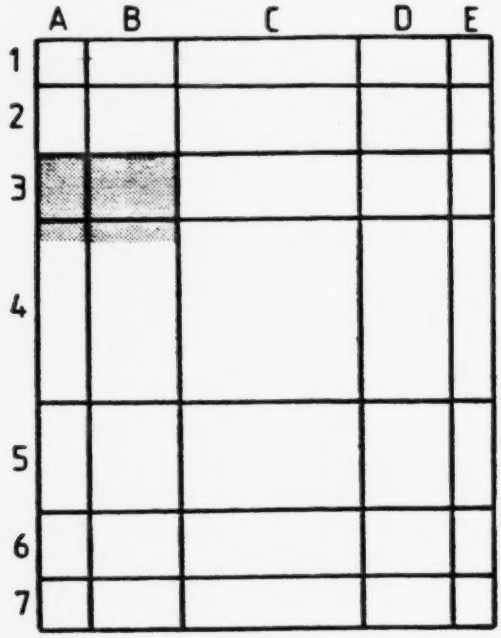
Ecosystem Unit: MHdp/02

Tsuga mertensiana - (Chamaecyparis notkatensis) - Cassiope mertensiana - Phyllodoce empetriformis - Pleurozium schreberi Submesic Mountain heather - Cassiope ecosystem association

No. of Releves: 1

Ecological Moisture Regime: submesic

Ecological Nutrient Regime: oligotrophic to submesotrophic



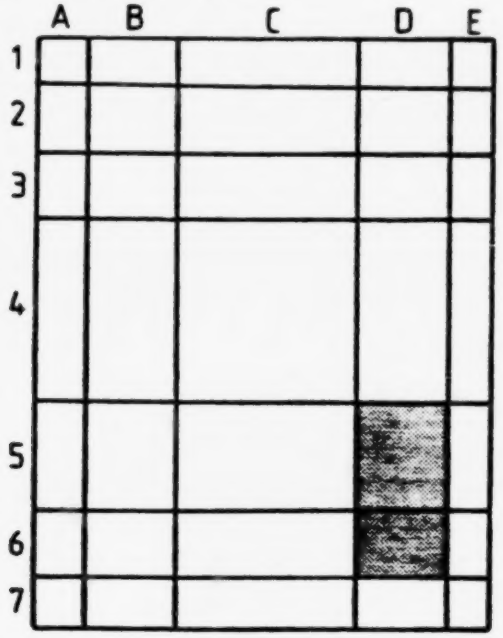
More samples are required to adequately describe this association. Occurs on exposed rock hummocks and slopes. Diverse shrub layer composed of Tsuga mertensiana, Chamaecyparis nootkatensis and Cladothamnus pyroliflorus. Cassiope mertensiana and Phyllodoce empetriformis are dominant herbs. Occurs as a climatic climax and disclimax (scrub forest) stage.

MHdp/03 SUBHYGRIC COPPERBUSH - SITKA VALERIAN - SPHAGNUM

Ecosystem Unit: MHdp/03
Cladothamnus pyroliflorus - *Valeriana sitchensis* - (*Veratrum viride*) - *Sphagnum* spp.
Subhygric Copperbush - Sitka valerian - *Sphagnum* ecosystem association

No. of Releves: 1

Ecological Moisture Regime: subhygric to hygric
Ecological Nutrient Regime: permesotrophic



More samples are required to adequately describe this association. Occurs in depressional areas and gullies. Tree species are usually lacking. *Cladothamnus pyroliflorus* dominates the shrub layer. Common herbs are *Valeriana sitchensis*, *Veratrum viride*, *Streptopus roseus* and *Gymnocarpium dryopteris*. *Sphagnum* spp. dominate the moss layer. Occurs as an edaphic climax and pioneer seral - shrub-seedling stage.

ECOSYSTEM ASSOCIATIONS OF THE MHe

ECOSYSTEM ASSOCIATIONS

01 Zonal Subalpine fir - Vaccinium - Creeping raspberry

02 Submesic Subalpine fir - Cassiope - Cladina

03 Subhygric Subalpine fir - Sitka valerian - Mnium

04 Sedge - Sphagnum wetland

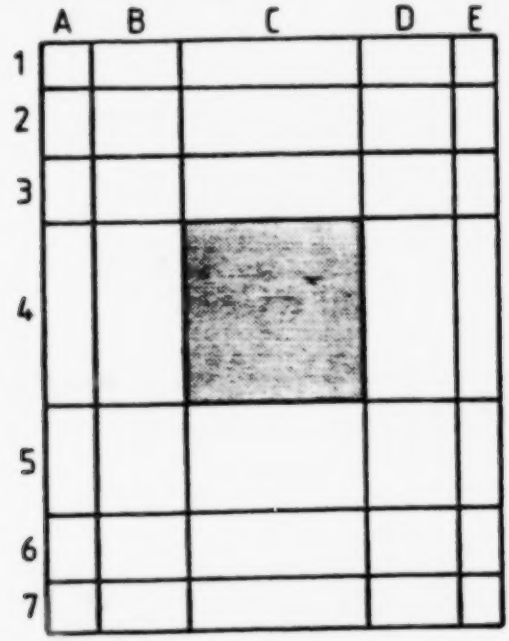
05 Willow - Sitka valerian avalanche track

MHe/01 ZONAL SUBALPINE FIR - VACCINIUM - CREEPING RASPBERRY

Ecosystem Unit: MHe/01
Abies lasiocarpa - *Menziesia ferruginea* - *Vaccinium membranaceum* - *Rubus pedatus* - *Streptopus roseus* - *Dicranum* spp.
Zonal Subalpine fir - *Vaccinium* - Creeping raspberry ecosystem association

No. of Releves: 1

Ecological Moisture Regime: mesic
Ecological Nutrient Regime: mesotrophic



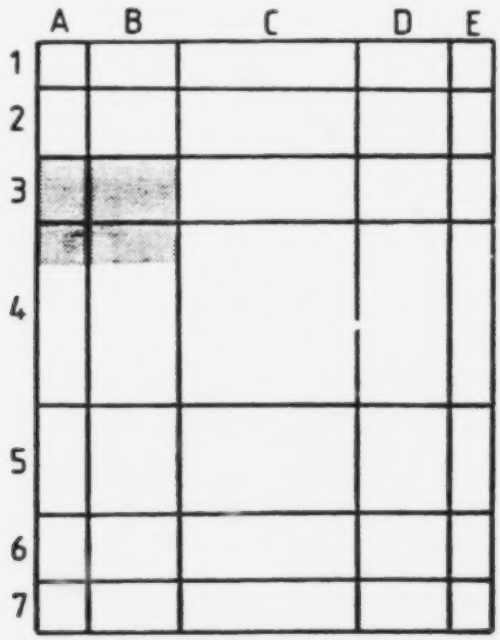
More samples are required to adequately describe this association. Occurs on morainal and colluvial blankets. *Abies lasiocarpa* is the dominant tree. The shrub layer is dominated by *Menziesia ferruginea* and *Vaccinium membranaceum*. Common herbs are *Rubus pedatus* and *Streptopus roseus*. In the sparse moss layer *Brachythecium* spp. and *Dicranum* spp. are common. Occurs as young and mature climatic climax.

MHe/02 SUBMESIC SUBALPINE FIR - CASSIOPE - CLADINA

Ecosystem Unit: MHe/02
Tsuga mertensiana - (*Abies lasiocarpa*) - *Cassiope mertensiana* - *Phyllodoce empetriformis* - (*Luetkea pectinata*) - *Cladina* spp.
Submesic Subalpine fir - Cassiope - *Cladina* ecosystem association.

No. of Releves: 1

Ecological Moisture Regime: submesic
Ecological Nutrient Regime: oligotrophic to submesotrophic



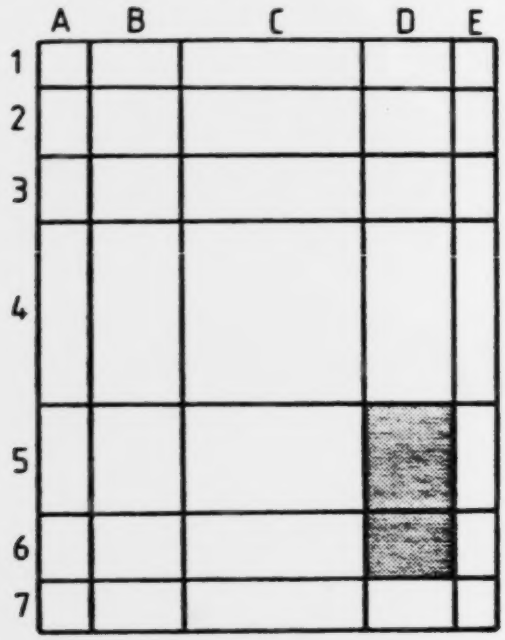
More samples are required to adequately describe this association. Occurs on colluvial and morainal veneers over rock and on rock hummocks and slopes. Tree species of *Tsuga mertensiana* (dominant) and *Abies lasiocarpa* occupy the shrub layer. Sporadic shrubs are *Vaccinium membranaceum* and *Sorbus scopulina*. *Cassiope mertensiana* and *Phyllodoce empetriformis* are dominant herbs. *Cladina* spp. dominate the moss layer. Occurs as an edaphic climax and disclimax stage (scrub forest).

MHe/03 SUBHYGRIC SUBALPINE FIR - SITKA VALERIAN - MNIUM

Ecosystem Unit: MHe/03
Abies lasiocarpa - Valeriana sitchensis - Leptarrhena pyrolifolia - Mnium spp.
Subhygric Subalpine fir - Sitka valerian - Mnium ecosystem association.

No. of Releves: 1

Ecological Moisture Regime: subhygric to hygric
Ecological Nutrient Regime: permesotrophic



More samples are required to adequately describe this association. Occurs in gullies and on seepage slopes. Abies lasiocarpa is dominant in the shrub layer. Vaccinium ovalifolium is a common shrub. Leptarrhena pyrolifolia and Valeriana sitchensis are dominant herbs. Mnium spp. dominate the moss layer. Occurs as an edaphic climax, and a pioneer seral - shrub-seedling stage.

MHe/04 SEDGE - SPHAGNUM WETLAND

Ecosystem Unit: MHe/04
Sedge - Sphagnum wetland

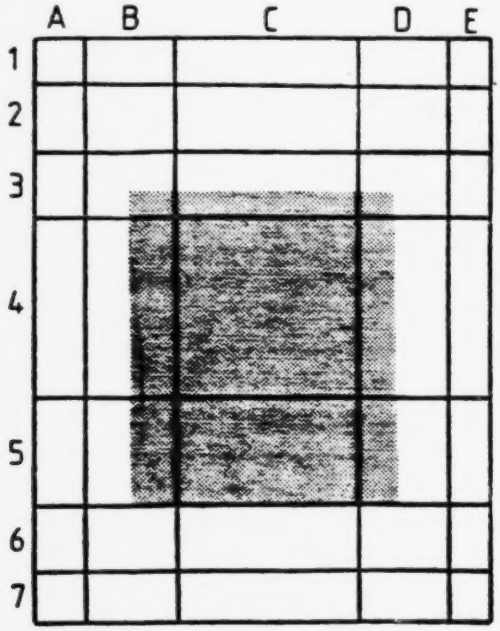
No samples have been obtained for this association. It is likely that it occurs on level valley floor sites on organic deposits. Carex spp. and Sphagnum spp. are probable dominant plant species.

MHe/05 WILLOW - SITKA VALERIAN AVALANCHE TRACK

Ecosystem Unit: MHe/05
Salix sitchensis - *Valeriana sitchensis* - *Veratrum viride* - (*Heracleum sphondylium*) - (*Senecio triangularis*) - *Brachythecium* spp.
Willow - Sitka valerian avalanche track ecossytem association.

No. of Releves: 2

Ecological Moisture Regime: submesic to subhygric
Ecological Nutrient Regime: submesotrophic to permesotrophic



More samples are required to adequately describe this association. It is probably very similar in composition to MHd/05. Three successional stages have been recognized and mapped. The pioneer seral - non-vegetated stage is characterized by the sporadic occurrence of shrubs and subalpine and alpine herbs. The pioneer seral - grass-forb stage may be dominated by *Valeriana sitchensis*, *Veratrum viride*, *Senecio triangularis*, *Heracleum sphondylium* and *Athyrium filix-femina*. The pioneer seral - shrub-seedling stage is typically dominated by *Salix* spp. and *Alnus sinuata*.

ECOSYSTEM ASSOCIATIONS OF THE MHep

ECOSYSTEM ASSOCIATIONS

01 Zonal Subalpine fir parkland

02 Submesic Cassiope - Mountain heather - Lophozia

03 Wetland

MHep/01 ZONAL SUBALPINE FIR PARKLAND

Ecosystem Unit: MHep/01
Zonal Subalpine fir parkland

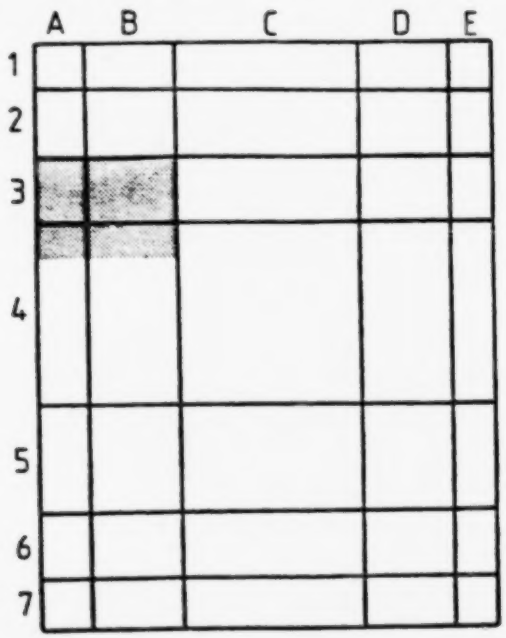
No samples have been obtained for this association. As the climatic climax for the subzone, it probably occurs on morainal and colluvial blankets. It is likely that Abies lasiocarpa and Vaccinium spp. are dominant plant species.

MHep/02 SUBMESIC CASSIOPE - MOUNTAIN HEATHER - LOPHOZIA

Ecosystem Unit: MHep/02
Tsuga mertensiana - (*Abies lasiocarpa*) - *Cassiope mertensiana* - *Phyllodoce empetriformis* - *Lophozia* spp. - *Cladina* spp.
Submesic Cassiope - Mountain heather - *Lophozia* ecosystem association.

No. of Releves: 1

Ecological Moisture Regime: submesic
Ecological Nutrient Regime: oligotrophic to submesotrophic



More samples are required to adequately describe this association. It occurs on colluvial and morainal veneers over rock and on rock hummocks and slopes. *Tsuga mertensiana* and *Abies lasiocarpa* are dominant in the shrub layer. *Cassiope mertensiana* and *Phyllodoce empetriformis* are the dominant herbs. *Lophozia* spp. and *Cladina* spp. dominate the moss layer. Edaphic climax and disclimax (scrub forests) stages are recognized.

MHep/03 WETLAND

Ecosystem Unit: MHep/03
Wetland ecosystem association

No samples have been obtained for this association. It is likely that it occurs in gullies and depressional areas of the parkland subzone. Probable dominant plant species are Cladothamnus pyroliflorus, Veratrum viride, Carex spp. and Sphagnum spp.

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APPENDIX A. ECOSYSTEM ASSOCIATION SYNTHESIS TABLES

The following tables are a summary of the vegetation data collected on sites during the course of field work. Data is organized by biogeoclimatic unit. Plant species are listed in vegetation layers (A = trees, B = shrubs and regeneration, C = herbs and dwarf shrubs, D = mosses, lichens and liverworts) and are ordered in a general xeric to hydric sequence. Numbers listed under plot numbers are per cent cover estimates for each plant species. For each vegetation layer a total cover estimate is given. FR stands for frequency; numbers in this column represent the number of plots (as a % of total plots in the association) that a given plant species occurs in. MC stands for mean cover; numbers in this column are the mean per cent cover values (MC = total per cent cover divided by number of plots). In some cases plots which are of a unique successional stage are not tallied with the rest of the association; they are noted as such. Associations with only one plot have no FR or MC compilation. Plant species names are given in standard latin code format (the first four letters of the genus name and the first three letters of the species name; for example Tsuga heterophylla (Western hemlock) is represented as TSUG HET). If only the genus name is used the code becomes the first seven letters of the genus, or less if the genus name is less than seven letters. For common names refer to Appendix C, Plant Species List.

APPENDIX A. - Table 1. CWH13/01
Zonal Western hemlock - Amabilis fir - Vaccinium - moss

	PLOT NO.	03	08	YCC 09	19	28	33	35	36	40	49	51	52	54	55	57	73	106	111	115	FR	MC
A	PSEU MEN							2		2		5	2							10	27	1
	THUJ PLI	5	5		5		2	3	2	5	2		3	5							55	2
	TSUG HET	40	5		20	35	13	40	15	45	15	30	40	35	10	35	20	18	20	13	100	35
	ABIE AMA		35		5	10	8		35	2	15		5	3	35	20	40	20	20	5	83	25
	PICE SIT										5										6	.5
	TSUG MER				5		4			3							5	5			27	1
	TOTAL COVER	40	45		35	45	25	45	50	55	35	35	50	40	45	55	65	40	40	25		45
B	MENZ FER	7			1	5	5	3	1	7	3	2	5	7		2	1	8	5		83	3
	VACC PAR	1	2	1						3										7	22	1
	VACC ALA	50	50	25	20	30	50	40	40	45	40	60	65	50	5	30	12	40	70	15	100	40
	VACC OVA				2	20	20	5	10	10	5	5	10	30		20	5	5			72	8
	VACC MEM					10	3		3	10					2						27	2
	RIBE LAX			2																	6	.5
	SORB SCO					1	1							.5				2			22	.5
	OPLO HOR		1																		6	.5
	RUBU PAR			10																		
	RIBE LAC			2																		
	THUJ PLI				1					1		5		2						10	27	2
	TSUG HET	8	8	15	4	4	2		10	5	5	2	8	4		5	7	7	5	15	89	6
	ABIE AMA	8	15	60	8		8		15	4	10	4	8	3	7	8	5	10	7	10	89	7
	TSUG MER				2	2	2											7			22	1
	TOTAL COVER	70	70	85	37	60	70	45	60	75	55	70	80	75	14	55	25	75	80	50		60
C	CLIN UNI	10	3	1	.5	5	2	3	1	3		2	3	5	1	3	2		5		83	3
	CORN UNA	30	3	5	3	3	3	10	3	3	3	3	5	5	1	3	2	5	1		94	5
	LYCO CLA	2	5	1		2															17	1
	GOOD OBL	1						1		.5		1							1	1	33	.5
	DRYO ASS			3													2				6	.5
	ORTH SEC	3			1	1		3	.5			.5	.5						1	1	50	1
	LINN BOR	2						.5				2									17	.5
	GYMN DRY	2	3	3													1				17	.5
	STRE ROS	1	10	10		2								2	1	.5	2				39	1
	RUBU PED		1		15	5	7		10		10		3	10	3	2	5	10	3		72	5
	TIAR UNI		2																		6	.5
	LISTERA		.5										.5								11	.5
	BLEC SPI		.5											3	.5						17	.5
	ATHY FIL		2																			
	TOTAL COVER	45	25	20	18	15	10	15	14	6	13	8	13	20	6	8	10	15	10	2		15
D	RHYT LOR	50	40	10	10	7	30	10	10	50	15	60	30	30	15	70	5	20	50		94	30
	RHYT ROB		20		40	30		50	50	20	60	10	50	50	15	5	5	30	10		83	25
	HYLO SPL	30		5	2	2	3	20	10	20	2	20	10	5		10			20	10	78	9
	MNIU INS														3						6	.5
	MNIU GLA													3					2		11	.5
	DICRANU			5	5	5	5		3						50		5	5	3	10	50	5
	SCAP BOL		5				5	5					3								22	1
	PLEU SCH			20	5		10		3							5					22	1
	TOTAL COVER	80	60	40	60	40	50	80	80	85	75	70	80	75	70	75	15	50	80	25		65

APPENDIX A. - Table 2. CWHi3/02
Submesic Western hemlock - (Amabilis fir - *Vaccinium*) - moss

	PLOT NO.	04	11	12	18	27	32	45	53	FR	MC
A	PSEU MEN				7	5	2	3	5	62	3
	THUJ PLI	10		5	5				5	50	3
	TSUG HET	20	25	35	45	8	10	40	55	100	30
	ABIE AMA			15						12	2
	PICE SIT					3				12	.5
	TSUG MER	5				2				25	1
TOTAL COVER		35	25	55	55	18	12	40	65		40
B	MENZ FER	5		2		3	2	.5	7	75	2
	VACC PAR	2					1	2	3	50	1
	VACC ALA	30	30	60	10		10	20	30	87	25
	VACC OVA	3					3			25	1
	VACC MEM	2			.5	2		1		50	1
	RIBE LAX						.5			12	.5
	SORB SCO	1								12	.5
	ALNU SIN	1				2				25	.5
	THUJ PLI	4			7			2	2	50	2
	TSUG HET	5	6	8	15	2	4	3	4	100	5
	ABIE AMA	2		7	3				2	50	2
	TSUG MER	5		1		2				37	1
TOTAL COVER		55	35	75	30	13	20	25	45		35
C	CLIN UNI	5	5	7					5	50	3
	CORN UNA	10	5	5	1		1	2	10	87	4
	LYCO CLA	2								12	.5
	GOOD OBL	1		.5				.5	.5	50	.5
	DRYO ASS	.5								12	.5
	ORTH SEC			1	5			.5	1	50	1
	LINN BOR			.5				5	.5	37	1
TOTAL COVER		17	10	10	6		1	7	15		8
D	RHYT LOR	5	60	30	3	2	10	20	20	100	20
	RHYT ROB	40	30	40	30	5		5	40	87	25
	HYLO SPL	20		2	5	25	30	60	20	87	20
	CLADONI					5				12	1
	DICRANU			5	3	5	5			50	2
	SCAP BOL				3				10	25	2
	PLEU SCH						40	5		25	5
TOTAL COVER		60	90	70	40	50	80	85	85		70

APPENDIX A. - Table 3. CWHi3/05
Devil's-club - fern - leafy moss

	PLOT NO.	PS 05	07	17	22	YEC 23	41	50	94	112	FR	MC
A	THUJ PLI		20			2					14	3
	TSUG HET	5	5	20	55	6	35		40		71	20
	ABIE AMA		20	8		5	15		3		57	7
	PICE SIT				2						14	.5
TOTAL COVER		5	45	28	55	10	50	-	40	-		30
B	MENZ FER	2	3		2	2					29	1
	VACC PAR		2								14	.5
	VACC ALA	5	10		35	10	40		5		57	13
	VACC OVA				20	20					14	3
	RIBE LAX	2				5						
	SORB SCO					1						
	OPLO HOR		10	50	1	1	10	50	30	65	100	30
	SAMB RAC	3										
	RUBU PAR	10				2						
	RUBU SPE		.5	3			10	5	5	7	86	5
	ACER GLA	15				3						
	SALI SIT	1										
	CORN SER					1		1			14	.5
	ALNU SIN	30								5	14	1
	VIBU EDU		.5								14	.5
	THUJ PLI					1						
	TSUG HET	3	8		5	8	2	7		2	71	3
	ABIE AMA		10			15	5	7		1	57	3
	PICE SIT					.5						
	TSUG MER	1										
TOTAL COVER		65	45	50	70	35	65	60	40	75		60
C	CLIN UNI		2				10	2			43	2
	CORN UNA		2			1	2		1		43	1
	LYCO CLA				.5						14	.5
	DRYO ASS	5	1		10	25	2		2	1	71	2
	ORTH SEC		2					1			29	.5
	LINN BOR		5								14	1
	GYMN DRY		25	3	10	15	20	20	15	10	100	15
	STRE ROS			20			5	10	5	2	71	5
	RUBU PED	2		1	1		15		.5		51	3
	TIAR UNI		10	5	.5		7	5	5	7	100	5
	LISTERA			1							14	.5
	BLEC SPI						2				14	.5
	VIOL GLA		3	20					1	1	29	4
	ATHY FIL	40		20			5		20	5	57	7
	STRE AMP	1		1			1	5	2	2	71	2
	TRIS CER	.5	.5								14	.5
	ARUN SYL	10								2	14	.5
	CAREX	.5										
	GALI TRL	1								.5	14	.5
	LYSI AME			.5				2			29	.5
	EPIL ANG	1				1						
	HEUC GLA	3										
	VERA VIR									1	14	.5
	PENS SER	2										
	SMIL STE		20								14	3
TOTAL COVER		60	60	65	20	40	50	40	40	25		45
D	RHYT LOR		15	5	50	20	10				51	10
	RHYT ROB		3		20		10				43	5
	HYLO SPL		3		5	5					29	1
	MNIU INS									10	14	1
	MNIU GLA		5	50			40	30	30	30	86	25
	BRACHYT			20				20	30	15	57	10
	CONO CON			10							14	1
	DICRANU		3			5					14	.5
	PLEU SCH					30						
	SPHAGNU						10				14	1
TOTAL COVER			20	85	70	70	70	50	60	55		60

APPENDIX A. - Table 4. CWHi 3/06
Floodplain spruce - Devil's-club

		PIONEER SERAL						MATURING SERAL						MATURE EDAPHIC CLIMAX							
				WET																	
	PLOT NO.	60	69	116	119	FR	MC	65	67	70	118	FR	MC	59	61	64	66	110	117	FR	MC
A	THUJ PLI													5						17	1
	TSUG HET													25	20	40		15		67	16
	ABIE AMA													10	5	5	25	20	2	100	11
	ALNU RUB							3	50	10	10	100	20								
	POPU TRI							5		35	10	75	12	5					3	33	1
	PICE SIT							10			5	50	4	20	10	15	10	15	15	100	15
TOTAL COVER								18	50	45	25		35	55	35	60	35	50	20		40
B	VACC PAR															1				17	.5
	VACC ALA														10					17	2
	VACC OVA													2	10	10	60	5	2	100	15
	VACC MEM																5	2	.5	50	1
	OPLO HOR							25	13	2		75	10	30	30	30		15		67	17
	SAMB RAC							15	4			50	5								
	RUBU SPE			.5	.5	33	.5	50	60	10		75	30		2		3	2	.5	67	1
	SALI SIT	3	4	2	7	100	3			1	4	50	1								
	CORN SER			.5				5	15	3		75	6	2			10		.5	50	2
	RIBE BRA							25	10			50	10								
	ALNU SIN	10	6	2	2	100	6			15		25	4				10		30	33	7
	VIBU EDU			1				2	7			50	2	2		3	3		.5	67	1
	LONI INV																3			17	.5
	RIBE LAC													1		2				33	.5
	SPIR DOU			1																	
	THUJ PLI	.5		.5		33	.5			1		25	.5				1		1	33	.5
	TSUG HET	1			.5	67	.5	2		8	.5	75	3	10	13		1	5	1	83	5
	ABIE AMA			.5	1	33	.5			1	4	50	1		3			7	5	50	3
	ALNU RUB	5	12	2	85	100	30	10	4	15	40	100	17				15		1	33	3
	POPU TRI	13	7		15	100	10				2	25	.5								
	PICE SIT	5		.5	3	67	2	5	7	7	8	100	7						2	17	.5
	ABIE LAS	5				33	2														
TOTAL COVER		40	25	10	95		55	95	85	40	50		67	40	50	40	75	45	40		48
C	CLIN UNI															3		1		33	1
	CORN UNI															2		2		33	1
	LYCO CLA													.5			2	.5	5	67	1
	GOOD OBL													.5		1			.5	50	.5
	DRYO ASS							1	2			50	1	1	5					33	1
	ORTH SEC	.5				33	.5			2	1	50	1	1		2	2	3	2	83	2
	GYMN DRY				.5	33	.5	5	7	3		75	4	5	15	25		5		67	12
	STRE ROS				.5	33	.5	1	4			50	1	10	1	15	2	2		83	5
	RUBU PED														2			10		33	2
	TIAR UNI				.5	33	.5	1	1			50	.5		10	10		10		50	5
	LISTERA																		.5	17	.5
	VIOL GLA				.5	33	.5	1	1		.5	75	1	1						17	.5

Table 4. (con't)

	PIONEER SERAL						MATURING SERAL						MATURE EDAPHIC CLIMAX							
			WET																	
PLOT NO.	60	69	116	119	FR	MC	65	67	70	118	FR	MC	59	61	64	66	110	117	FR	MC
ATHY FIL			.5					3	2		50	1		3					17	.5
STRE AMP				.5	33	.5		1					.5	2			2		50	1
TRAU CAR														.5					17	.5
TRIS CER										.5	25	.5				.5		.5	33	.5
ARUN SYL		.5			33	.5	10	5		1	75	4								
EPIL LAT		2			33	1				.5	25	.5								
CAREX		.5	10	1	67	1				1	25	.5								
AQUI FOR		.5			33	.5														
GALI TRI				.5	33	.5			.5		25	.5								
VALE SIT		&														.5			17	.5
EPIL ANG									1		25	.5								
EQUI ARV																1			17	.5
ELYM GLA		1			33	.5		3			25	1								
CALAMAG			5																	
HEUC GLA										.5	25	.5								
HERA SPH										.5	25	.5								
SANG CAN			.5																	
PENS SER		.5			33	.5														
ACHI MIL		.5			33	.5														
JUNCUS			40																	
MIMU LEW			.5																	
AGRO SCA			15																	
TOTAL COVER	.5	4	75	2		2	15	20	13	5		13	15	30	50	5	30	10		25
D RHYT LOR													5				30	30	50	11
RHYT ROB													5				5		33	2
HYLO SPL									2		25	.5						10	17	2
MNIU INS							5				25	1			20		5		33	6
MNIU GLA													10	30	10		15		67	11
BRACHYT							5	5			50	2	10	40	10	10			67	12
CLADONI	20				33	7														
CLADINA	10				33	3														
RHACOMI	30	20		5	100	18				10	25	2								
DICRANU																	5		17	1
POLY JUN	15	5		1	100	7				2	25	.5	3	5					33	1
STEREOC	40				33	13														
TOTAL COVER	80	25		5		37	10	5	2	10		7	30	70	40	10	60	40		40

APPENDIX A. - Table 5. CWHi 3/08
Sitka mountain alder - Lady fern avalanche track

	NONVEGETATED						GRASS-FORB									SHRUB-SEEDLING									
PLOT NO.	25	47	71	103	FR	MC	02	26	48	85	93	95	105	FR	MC	01	24	46	62	63	68	104	109	FR	MC
RIBE LAX										1				14	.5										
OPLO HOR									10					14	1	5	10	15	3		5	5		75	5
SAMB RAC							10		10	.5	10	10	1	86	6	25	20	4	30			2	2	75	10
RUBU PAR	1	.5			50	.5		60		1				29	9					80				12	10
RUBU SPE									40	1	3	3		57	7	35		13	30		70	3	30	75	25
ACER GLA							5	2	5					43	2										
SALI SIT	2	.5		1	75	1		10						14	1		60			5			5	38	10
CORN SER																		40	15	15	10		5	62	10
RIBE BRA																	50	3	3				10	50	8
ALNU SIN		.5	.5	1	75	.5	5	10	20	3				57	5	90	25	80	85	5	95	85	85	100	70
VIBU EDU																				5				12	1
LONI INV																	10							12	1
RIBE LAC																	3							12	.5
SPIR DOU										.5				14	.5										
TSUG HET				.5	25	.5											1					1		25	.5
POPU TRI		.5			25	.5															2			12	.5
PICE SIT																	1							12	.5
TOTAL COVER	3	1	.5	2	100	2	20	70	60	5	10	13	1		25	100	100	95	100	95	100	90	95		97
CRYO ASS																					.5	3	10	38	2
GYMN DRY																	20	15				30	5	50	7
STRE ROS							10				1			29	2	15	2	2	10	3				62	4
TIAR UNI																		10					5	25	2
JUNCUS			1		25	.5																			
LUET PEC			5		25	1																			
VIOL GLA	.5				25	.5	10				1	5		43	2	10	.5						1	38	1
ATHY FIL				1	25	.5	40	5	60		40	40	5	86	30	30	30	5	10	5		10	10	88	12
STRE AMP																			3			10		25	2
TRAU CAR																			3	1				25	.5
TRIS CER																					.5			12	.5
ARUN SYL	3	1		1	75	1		50		2	5	40	5	71	20							5	.5	25	1
EPIL LAT		.5	.5	.5	75	.5			10					14	1										
CAREX	.1			1	50	.5				20	.5		3	43	3		.5							12	.5
AQUI FOR	.5	.5	.5		75	.5				5				14	1										
GALI TRL	.1	.5			50	.5				5	1			29	1		5	1		.5			1	50	1
VALE SIT	1				25	.5		1		3	1	20	5	71	4										
EPIL ANG			.5		25	.5		3		1	60	5		57	9		.5							12	.5
CIRC ALP																		1						12	.5
EQUI ARV										1				14	.5		2		2	1				38	1
SENE TRI																				.5				12	.5
ELYM GLA																				5				12	1
CALAMAG				.5	25	.5				30				14	4					20				12	2
HEUC GLA		.5		.5	50	.5							1	14	.5						.5	2		25	.5
TELL GRA	1	.5			50	.5				1				14	.5								1	12	.5
TERA VIR							20	1	5		5	10	1	86	6					20				12	2
URTI DIO							5					5		29	1										
HERA SPH	1				25	.5		5		2	10			43	2					20				12	2

Table 5. (con't)

	NONVEGETATED						GRASS-FORB									SHRUB-SEEDLING									
PLOT NO.	25	47	71	103	FR	MC	02	26	48	85	93	95	105	FR	MC	01	24	46	62	63	68	104	109	FR	MC
PTER AQU							60		10					29	10										
DRYO FIL									10			10	75	43	15			40						12	5
SANG CAN	.5				25	.5				10			3	29	2										
OXYR DIG	.1	.5	.5	.5	100				5			2	29	1											
PENS SER	.5	1			50	.5				5				14	1										
ARTEMIS	.5			.5	50	.5																			
VAHL ATR	7				25	2							10	14	1										
ROMA SIT	.1	1	1		75	1																			
ACHI MIL	.1	.5		.5	75	.5				2				14	.5										
SAXIFRA			2	.5	50	1																			
POA	.5	.5	.5		75	.5																			
PRUN VUL	3	.5			50	1				2				14	.5										
MIMU LEW		1			25	.5																			
DISP HOO	3				25	1		10								2								12	.5
TOTAL COVER	15	3	10	10		10	100	60	75	75	95	95	95	85		55	55	60	30	55	2	45	30		40
D RHYT LOR																		5						12	1
MNIU INS												30		14	4		40	40		5		10	15	62	14
MNIU GLA																	10	30						25	5
BRACHYT									20					14	3			20		10		5		38	4
RHACOMI			5	5	50	2				10				14	1										
POLYTRI				2	25	.5																2		12	.5
TOTAL COVER			5	7		3			20	10		30			9		50	80		15		15	15		20

APPENDIX A. - Table 6. CWHI3/07 and 09

07 - Skunk-cabbage
09 - Sedge fen

		07					09			
	PLOT NO.	10	13	34	FR	MC	14	58	FR	MC
B	MENZ FER						2		50	1
	VACC OVA						1		50	.5
	OPLO HOR	10	2	10	100	7				
	RUBU SPE	3	2	1	100	2				
	CORN SER	25	5	50	100	27				
	RIBE BRA			15	33	5				
	ALNU SIN		8		33	3				
	VIBU EDU		5		33	2				
	SPIR DOU						.5	2	100	1
	TSUG HET						1		50	.5
	ALNU RUB							.5	50	.5
	PICE SIT							2	50	1
	TSUG MER						4		50	2
TOTAL COVER		35	20	60		40	9	4		5
C	CORN UNA	.5			33	.5				
	DRYO ASS	5			33	2				
	GYMN DRY	10	3	1	100	5				
	STRE ROS	10	5	10	100	8				
	TIAR UNI	10	2	2	100	5				
	VIOL GLA	5	3	1	100	3				
	ATHY FIL	40	60	30	100	45				
	STRE AMP		2	.5	67	1				
	TRAU CAR			3	33	1				
	CAREX		1		33	.5	15	40	100	27
	LYSI AME	20	30	40	100	30				
	VALE SIT		5		33	2				
	CALAMAG							1		
	VERA VIR	.5			33	.5				
	MENY TRI						10	30	100	20
TOTAL COVER		85	90	80		85	35	70		50
	MNIUM	40	20	40	100	35				
	BRACHYT		10	30	67	13				
	CLADINA						3		50	2
	CONO CON	5	5	2	100	4				
	SPHAGNU	40	40		67	27	80	40	100	60
TOTAL COVER		80	70	70		75	80	40		60

APPENDIX A. - Table 7. MHd/01
Zonal Mountain hemlock - Vaccinium - moss

	PLOT NO.	06	15	20	21	29	30	37	56	74	80	YCC 84	89	YCC 96	108	114	FR	MC
A	TSUG HET	8	8	8		20	2	1	5							5	60	4
	ABIE AMA	2	3	7	10	15	5	2	10	10	5		20		20	20	100	10
	TSUG MER	20	20	25	20	5	15	10	20	30	5		25		35	15	100	30
	CHAM NOO			5				2									15	.5
	ABIE LAS											10						
TOTAL COVER		30	30	50	30	40	20	15	35	40	10	10	45		55	40		35
B	VACC MEM	5	10	3	5	10	10	10	20	30		5	5			10	85	10
	MENZ FER	5	3	5	4	10		4	4				5	.5	.5	5	77	3
	CLAD PRY		30	1	35	8	50	40						.5			45	13
	VACC ALA	50	40	10	10	10			20				10		20	5	69	13
	VACC OVA	15	5	40	20	40	30	40	30	20		5	20	10	10	30	92	25
	SORB SCO	2	1			1	8		2			2		1		1	46	1
	ALNU SIN	2			6									2			15	1
	RIBES													3				
	TSUG HET	2	4													2	23	1
	ABIE AMA	7	4		5			7	10	13	7		10	4	15	15	77	7
	TSUG MER	13	9		8		5	8	5	3	25	15	1	15	3	5	85	6
	CHAM NOO				2			2									15	.5
	ABIE LAS										3	20		5			8	.5
TOTAL COVER		90	95	55	75	65	85	80	70	55	30	45	45	40	40	55		65
C	PHYL EMP		1				3	1			25	50		5			31	2
	CASS MER						2				5	2					15	1
	RUBU PED	3	5	10	5	10	20	5	10	20	.5			5	5		85	7
	CORN UNA	2	3	2	1	5	2	.5	5					2		3	69	2
	STRE ROS	2				5	3			30					5		38	3
	ORTH SEC	.5		1								1					15	.5
	CLIN UNI		3			5	1									1	31	1
	VERA VIR					1						2		1			8	.5
	GYMN DRY					1								10			8	.5
	LISTERA						1										8	.5
	TIAR UNI									2							8	.5
	LUET PEC											10						
	ARNI LAT											3						
	CALAM													10				
	EPIL ANG													1				
TOTAL COVER		7	10	13	6	25	25	5	15	50	30	60		40	10	4		15
D	RHYT LOR	5	40	15		10	30		40						20		54	12
	RHYT ROB	60		40	50	30	20	5	20	30			10		10	50	85	25
	LOPHOZI							10			30			10			15	3
	DICRANU	10	5	10	10	10	10	30	10	5	10	30	20	30	10	5	100	10
	PLEU SCH		20				10	50	10					10			31	7
	SCAP SOL						10		3								15	1
	MNIU GLA									30					5		15	3
TOTAL COVER		75	65	65	60	50	60	85	75	60	40	50	35	50	40	50		60

APPENDIX A. - Table 8. MHd/02, 03 and 04

02 - Submesic Mountain hemlock - moss
03 - Subhygric Mountain hemlock - Lady fern - Sitka valerian
04 - Sedge - *Sphagnum* wetland

		02				03				04			
	PLOT NO.	16	113	FR	MC	86	107	FR	MC	42	91	FR	MC
A	PSEU MEN	3		50	2								
	TSUG HET		2	50	1								
	TSUG MER	3	10	100	6					2		50	1
	CHAM NOO									2		50	1
	ABIE LAS		5	50	3								
TOTAL COVER		6	17		12					4			2
B	VACC MEM	3		50	2	3		50	2	4		50	2
	MENZ FER	1	7	100	4					1		50	.5
	CLAD PYR	2		50	1					3		50	2
	VACC ALA		10	50	5								
	VACC OVA		10	50	5	3	2	100	2	3		50	2
	SORB SCO					3	5	100	2				
	SALIX					1		50	.5				
	RUBU SPE						5	50	2				
	OPLO HOR						30	50	15				
	TSUG HET	3	2	100	2					2		50	1
	ABIE AMA	3	15	100	9	2	1	100	2				
	TSUG MER	7	10	100	8	15	1	100	8	5		50	2
	CHAM NOO		15	50	8					8		50	4
TOTAL COVER		19	55		35	20	35		27	22			10
C	CRYP CRI	.5		50	.5								
	PHYL EMP	.5		50	.5	2		50	1	2		50	1
	RUBU PED						10	50	5				
	CORN UNA									10		50	5
	STRE ROS					15	2	100	8				
	VERA VIR					5		50	2				
	GYMN DRY					5	10	100	8				
	TIAR UNI					5	5	100	5	1		50	.5
	SANG CAN					5		50	2	2	5	100	4
	VALE SIT					20	.5	100	10	2		50	1
	VAHL ATR					1		50	.5				
	DESC CES									1		50	.5
	ERIOPHO									.5		50	.5
	TRIE ARC									3		50	2
	CAREX									60	70	100	65
	PLATANT									1	5	100	3
	LYSI AME									5	1	100	3
	SENE TRI										5	50	2
	STRE AMP									1		50	.5
	ATHY FIL					5	25	100	15	.5		50	.5
	EPIL ANG					2		50	1	1		50	.5
	VIOL GLA					3	.5	100	4				
	LEPT PYR									10		50	5
TOTAL COVER		1			.5	50	50		50	85	85		85
D	SCAP BOL					5		50	2				
	HYLO SPL		10	50	5								
	RHYT LOR		30	50	15		20	50	10				
	RHYT ROB		40	50	20								
	LOPHOZI						30	50	15				
	DICRANU					5	5	100	5				
	PLEU SCH	10		50	5								
	STEREOC	5		50	2								
	CLADINA	10		50	5								
	CLADONI	8		50	4								
	SPHAGNU									85	50	100	5
	MNIU GLA					5	5	100	5				
TOTAL COVER		30	75		50	10	60		35	85	50		70

APPENDIX A. - Table 9. MHd/05
Sitka mountain alder - Willow - Sitka valerian
avalanche track

		NONVEGETATED				GRASS-FORB							SHRUB-SEEDLING							
	PLOT NO.	16	87	FR	MC	72	81	82	101	102	FR	MC	75	83	88	90	92	97	FR	MC
B	CLAD PYR												5						17	1
	SORB SCO		5	50	.5	1				2	40	1	3		.5				33	1
	ALNU SIN		3	50	2			3			20	1		10	8	80	80	85	83	45
	SALI SIT		.5	5	.5									10	70			5	50	15
	SALIX												20	20					33	7
	SALI BAR	2		50	1								50	40	15				50	18
	RUBU SPE						50	5			40	11			2	1			33	.5
	OPLO HOR																	25	17	4
	RIBES															1		2	33	.5
	ABIE AMA							1			20	.5								
	TSUG MER		1	50	.5			1			20	.5	1							
	ABIE LAS								.5		20	.5								
	TOTAL COVER	2	4	100	3	1	50	10	.5	2		13	65	65	80	85	80	95		80
C	PHYL EMP		70	50	35															
	CASS MER		2	50	1															
	STRE ROS						2	5			40	1				20		30	33	8
	VERA VIR					2	10	5	5	10	100	6	1		1	2			50	1
	GYMN DRY						1				20	.5	1		5			5	50	2
	TIAR UNI												2		2	2		1	67	1
	LUET PEC	5	5	100	5	5					20	1	2						17	.5
	SANG CAN					2			5	10	60	3	5						17	1
	VALE SIT	10	2	100	6	30	20		20	40	80	20	30	1	30	2		10	83	12
	VAHL ATR	2	2	100	2	25					20	5	3	2	2		1		67	1
	CAREX	2		50	1	50	1		40	50	80	30		1	1				33	.5
	PLATANT													.5					17	.5
	MITE PENT												.5	.5	1				50	.5
	EPILOBI	1	1	100	1		.5			1	40	.5	.5	.5			.5		50	.5
	ARNI LAT		1	50	.5										15				17	2
	HERA SPH						20	5	30		60	11			5	2			33	1
	ERIG PER		.5	50	.5										1				17	.5
	GALI TRI						1	1	1		60	1				2			17	.5
	SENE TRI						3	10	15	10	80	8			.5				17	.5
	TELL GRA															5	.5		33	1
	STRE AMP														1	1		1	50	.5
	URTI DIO															1			17	.5
	MIMU LEW													.5					17	.5
	POA ARC					1			.5		40	.5					1		17	.5
	EPIL LAT	5		50	2									1					17	.5
	SIBB PRO	.5		50	.5															
	CASTILL		.5	50	.5				5		20	1								
	CALAM					3	3	1			60	1								
	ATHY FIL	.5		50	.5	2	30	50			60	15	2		2	60		20	67	7
	ARUN SYL						30	40			40	15				2			17	.5
	EPIL ANG					5	2	20			60	5								
	VIOL GLA							5	2	3	60	1			5	5			33	2
	ELYM GLA								.5		20	.5								
	EQUISET	.5		50	.5				5	1	40	1		60					17	10
	LUZU PAR	.5		50	.5										2				17	.5
	TOTAL COVER	25	80		50	95	90	95	95	95		95	40	70	65	80	15	50		50

Table 9. (con't)

		NONVEGETATED				GRASS-FORB							SHRUB-SEEDLING							
	PLOT NO.	16	87	FR	MC	72	81	82	101	102	FR	MC	75	83	88	90	92	97	FR	MC
D	RHACOMI		10	50	5													10	17	2
	DICRANU		30	50	15															
	BRACHYT						30	10	30		60	14	10		15				33	4
	MNIU INS						30	30			40	12	10		20				33	5
	SPHAGNU													5					17	1
TOTAL COVER			45		20		60	40	30			25	20	5	40			10		13

APPENDIX A. - Table 10. MHdp/01, 02, 03; MHe/01, 02, 03, 05; MHep/02

MHdp/01 - Mountain hemlock - Cassiope - Cladina
/02 - Submesic Mountain heather - Cassiope
/03 - Subhygric Copperbush - Sitka valerian - Sphagnum

MHe/01 - Subalpine fir - Vaccinium - Creeping raspberry
/02 - Subalpine fir - Cassiope - Cladina
/03 - Subalpine fir - Sitka valerian - Mnium
/05 - Willow - Sitka valerian avalanche track

MHep/02 - Cassiope - Mountain heather - Lophozia

BIOG. UNIT		MHdp							MHe					MHep
ECO. ASS.		01					02	03	01	02	03	05		02
PLOT NO.		31	38	39	FR	MC	44	43	100	77	78	99	79	98
A	TSUG MER	5			33	2								
	ABIE LAS								35					
TOTAL COVER		5				2			35					
B	VACC MEM		5	1	67	2	5		10	1				5
	MENZ FER	1	3		67	1			15					
	CLAD PYR	30	10		67	13	20	60						1
	VACC OVA	5	15		67	7		10	2		5			1
	SORB SCO	4	1	1	100	2		4	2	.5				
	ALNU SIN											.5		
	SALI SIT												90	
	SALI BAR										2			
	RUBU SPE												10	
	ABIE AMA	10	1	4	100	5		1		2				2
	TSUG MER	15	10	3	100	9	10		3	15	1			13
	CHAM NOO		5		33	2	8							
	ABIE LAS						2		4	5	15	.5		5
	VACC DEL	2			33	1	10							
TOTAL COVER		50	40	9		33	55	70	30	20	23	1	95	25
C	PHYL EMP	30	5	20	100	25	30			10	2			30
	CASS MER	40	40	50	100	43	40			20	5			40
	RUBU PED	3	1		67	1	2	3	20					.5
	CORN UNA		1		33	.5								
	STRE ROS							10	15				10	
	VERA VIR			.5	33	.5		10	.5			5	15	
	GYMN DRY							10	3				15	
	TIAR UNI							1	2			1	1	
	LUET PEC	1	.5	2	100	2			5					
	SANG CAN												5	
	VALE SIT							40			10	20	20	
	VAHL ATR										1			
	CAREX										2	1		

Table 10. (con't)

BIOG. UNIT	MHdp							MHe					MHep
ECO. ASS.	01					02	03	01	02	03	05		02
PLOT NO.	31	38	39	FR	MC	44	43	100	77	78	99	79	98
PLATANT										.5		2	
MITE PEN							1						
EPILOBI											1		
ARNI LAT										2			
HERA SPH											30		
ERIG PER										2			
SENE TRI										.5	30		
STRE AMP							3					2	
POA ARC											.5		
EPIL LAT										5	5		
CASTILL											3		
ATHY FIL							5					20	
EPIL ANG										.5			
EQUISET											2	1	
LEPT PYR										70			
OXYR DIG											15		
TOTAL COVER	70	45	70		60	70	65	40	35	85	80	70	70
D BRACHYT								10				20	
RHYT ROB		5	5	67	3			5					
RHACOMI										2			
LOPHOZI		20	10	67	10								25
DICRANU	5		5	67	3			10	10				5
PLEU SCH	10	10		67	7	20							
CLADINA	40	40	40	100	40	10			30				20
CLADONI	1		2	67	1				.5				2
SPHAGNU							60						
MNIUM										15		20	50
TOTAL COVER	50	70	60		60	30	60	25	40	15			

Appendix B. TOTAL FREQUENCY TABLES

These tables summarize the frequency ratings for all associations represented by two or more plots. Associations with only one plot have species present marked with a "√". Format is the same as for Appendix A. Within associations successional stages are noted and plant species recorded independently.

APPENDIX B. - Table 11. Total Frequency for CWHl3 Ecosystem Associations

ECOS. ASS.		01	01	02	05	05	05	06	06	06	06	07	08	08	08	09	
SUCC. STAGE		YCC	MCC	MEC	PS	YEC	MEC	PS	PS-WET	MS	MEC	MEC	NV	HERB	SHRUB	MEC	TOTAL
NO. OF RELEVES		1	18	8	1	1	7	3	1	4	6	3	4	7	8	2	74
A	PSEU MEN		27	62													
			55	50		✓	14				17						
	TSUG HET		100	100	✓	✓	71				67						
	ABIE AMA		83	12		✓	57				100						
	ALNU RUB									100							
	POPU TRI									75	33						
	PICE SIT		6	12			14			50	100						
	TSUG MER		27	25													
MEAN TOTAL COVER			45	40	5	10	30			35	40						
B	MENZ FER		83	75	✓	✓	29									50	
	VACC PAR	✓	22	50			14				17						
	VACC ALA	✓	100	87	✓	✓	57				17						
	VACC OVA		72	25		✓	14				100					50	
	VACC MEM		27	50							50						
	RIBE LAX	✓	6	12	✓	✓								14			
	SORB SCO		22	12		✓											
	OPLO HOR		6			✓	100			75	67	100		14	75		
	SAMB RAC				✓					50				86	75		
	RUBU PAR	✓			✓	✓							50	29	12		
	RUBU SPE						86	33	✓	75	67	100		57	75		
	ACER GLA				✓	✓								43			
	SALI SIT				✓			100	✓	50			75	14	38		
	ORN SER					✓	14		✓	75	50	100			62		
	RIBE BRA									50		33			50		
	ALNU SIN			25	✓		14	100	✓	25	33	33	75	57	100		
	VIBU EDU						14		✓	50	67	33			12		
	LONI INV										17				12		
	RIBE LAC										33				12		
	SPIR DOU								✓					14		100	
	THUJ PLI		27	50		✓		33	✓	25	33						
	TSUG HET	✓	89	100	✓	✓	71	67		75	83		25		25	50	
	ABIE AMA	✓	89	50		✓	57	33	✓	50	50						
	ALNU RUB							100	✓	100	33					50	
	POPU TRI							100		25			25		12		
	PICE SIT					✓		67	✓	100	17				12	50	
	TSUG MER			37												50	
MEAN TOTAL COVER		85	60	35	65	35	60	55	10	67	48	40	2	25	97	6	
C	CLIN UNI	✓	83	50			43				33						
	CORN UNA	✓	94	87		✓	43				33	33					
	LYCO CLA	✓	17	12			14				67						
	GOOD OBL		33	50							50						
	DRYO ASS	✓	6	12	✓	✓	71			50	33	33			38		
	ORTH SEC		50	50			29	33		50	83						

APPENDIX B. - Table 11 (con't). Total Frequency for CWHI3 Ecosystem Associations

ECOS. ASS.	01	01	02	05	05	05	06	06	06	06	07	08	08	08	09	
SUCC. STAGE	YCC	MCC	MEC	PS	YEC	MEC	PS	PS-WET	MS	MEC	MEC	NV	HERB	SHRUB	MEC	TOTAL
NO. OF RELEVES	1	18	8	1	1	7	3	1	4	6	3	4	7	8	2	74
LINN BOR		17	37			14										
GYMN DRY	✓	17			✓	100	33		75	67	100			50		
STRE ROS	✓	39				71	33		50	83	100		29	62		
RUBU PED		72	12	✓		51				33						
TIAR UNI		6				100	33		50	50	100			25		
LISTERA		11				14				17						
BLEC SPI		17				14										
VIOL GLA						29			75	17	100	25	43	38		
ATHY FIL	✓			✓		57		✓	50	17	100	25	86	88		
STRE AMP						71	33			50	67			25		
TRAU CAR										17	33			25		
TRIS CER				✓		14			25	33				12		
ARUN SYL				✓		14	33		75			75	71	25		
EPIL LAT							33		25			75	14			
CAREX				✓			67	✓	25		33	50	43	12	100	
AQUI FOR							33					75	14			
GALI TRI				✓		14	33		25			50	29	50		
LYSI AME						29					100					
VALE SIT										17	33	25	71			
EPIL ANG				✓	✓				25			25	57	12		
CIRC ALP														12		
EQUI ARV										17			14	38		
SENE TRI														12		
ELYM GLA							33		25					12		
CALAMAG								✓				25	14	12		
HEUC GLA				✓					25			50	14	25		
TELL GRA												50	14	12		
VERA VIR						14					33		86	12		
URTI DIO													29			
HERA SPH									25			25	43	12		
PTER AQU													29			
DRYO FIL													43	12		
SANG CAN								✓				25	29			
OXYR DIG							33					100	29			
PENS SER				✓								50	14			
ARTEMIS												50				
VAHL ATR												25	14			
ROMA SIT												75				
ACHI MIL							33					75	14			
SAXIFRA												50				
POA												75				
PRUN VUL												50	14			
MIMU LEW								✓				25				
MENY TRI															100	
JUNCUS								✓				25				
MEAN TOTAL COVER	20	15	8	60	40	45	2	75	13	25	85	10	85	40	50	

APPENDIX B. - Table 11 (con't). Total Frequency for CWHi3 Ecosystem Associations

ECOS. ASS.		01	01	02	05	05	05	06	06	06	06	07	08	08	08	09	
SUCC. STAGE		YCC	MCC	MEC	PS	YEC	MEC	PS	PS-WET	MS	MEC	MEC	NV	HERB	SHRUB	MEC	TOTAL
NO. OF RELEVES		1	18	8	1	1	7	3	1	4	6	3	4	7	8	2	74
D	RHYT LOR	✓	94	100		✓	51				50						
	RHYT ROB		83	87													
	HYLO SPL	✓	78	87		✓	29			25	17						
	MNIUM											100					
	MNIU INS		5				14			25	33			14	62		
	MNIU GLA		11				86				67				25		
	BRACHYT						57			50	67	67		14	38		
	CLADONI			12				33									
	CLADINA							33								50	
	RHACOMI							100		25			50	14			
	COMO CON						14					100					
	DICRANU		50	50		✓					17						
	SPHAGNU						14					67				100	
	POLY JUN							100		25	33		25		12		
MEAN TOTAL COVER		40	65	70		70	60	37		7	40	75	3	9	20	60	

APPENDIX B. - Table 12. Total Frequency for MH Ecosystem Associations

BIOG. UNIT	MHd								MHdp			MHe					MHep
ECOS. ASS.	01	01	02	03	04—05		05	05	01	02	03	01	02	03	05	05	02
SUCC. STAGE	YCC	MCC	MEC	MEC	MEC	NV	HERB	SHRUB	MCC	MEC	MEC	MCC	MEC	MEC	HERB	SHRUB	MEC
NO. OF RELEVES	2	13	2	2	2	2	5	6	3	1	1	1	1	1	1	1	1
A PSEU MEN			50														
TSUG HET		60	50														
ABIE AMA		100															
TSUG MER		100	100		50				33								
CHAM NOO		15			50												
ABIE LAS	50		50									✓					
MEAN TOTAL COVER	5	35	12		2				2			35					
B VACC MEM	50	85	50	50	50				67	✓		✓	✓				✓
MENZ FER	50	77	100		50				67			✓					
CLAD PYR	50	46	50		50			17	67	✓	✓						✓
VACC ALA		69	50														
VACC OVA	100	92	50	100	50				67		✓	✓		✓			✓
SORB SCO	100	46		100		50	40	33	100		✓	✓	✓				
ALNU SIN	50	15				50	20	83							✓		
SALI SIT						50		50								✓	
SALIX				50				33									
SALI BAR						50		50						✓			
RUBU SPE				50			40	33								✓	
OPLO HOR				50				17									
RIBES	50			50				33									
TSUG HET		23	100		50												
ABIE AMA	50	77	100				20		100		✓		✓				
TSUG MER	100	85	100	100	50	50	20		100	✓		✓	✓	✓			✓
CHAM NOO		15	50	100	50				33	✓							
ABIE LAS	100	8					20			✓		✓	✓	✓	✓		✓
MEAN TOTAL COVER	42	65	35	27	10	3	13	80	33	55	70	30	20	23	1	95	25
C CRYP ORI			50														
PHYL EMP	100	31	50	50	50	50			100	✓			✓	✓			✓
CASS MER	50	15				50			100	✓			✓	✓			✓
RUBU PED	50	85		50					67	✓	✓	✓					✓
CORN UNA	50	69			50				33								
STRE ROS		38		100			40	33			✓	✓				✓	
ORTH SEC	50	15															
CLIN UNI		31															
VERA VIR	100	8		50			100	50	33		✓	✓		✓	✓	✓	
GYMN DRY	50	8		100			20	50			✓	✓				✓	
LISTERA		8															
TIAR UNI		8		100	50			67			✓	✓			✓	✓	
LUET PEC	50					100	20	17	100	✓			✓				
SANG CAN				50	100		60	17									
VALE SIT	50			100	50	100	80	83			✓			✓	✓	✓	

APPENDIX B. - Table 12. (con't). Total Frequency for MH Ecosystem Associations

BIOG. UNIT	MHd								MHdp			MHe					MHep
ECOS. ASS.	01	01	02	03	04	05	05	05	01	02	03	01	02	03	05	05	02
SUCC. STAGE	YCC	MCC	MEC	MEC	MEC	NV	HERB	SHRUB	MCC	MEC	MEC	MCC	MEC	MEC	HERB	SHRUB	MEC
NO. OF RELEVES	2	13	2	2	2	2	5	6	3	1	1	1	1	1	1	1	1
VAHL ATR				50		100	20	67						✓			
DESC CES					50												
ERIOPH					50												
TRIE ARC					50												
CAREX					100	50	80	33						✓	✓		
PLATANT					100			17						✓		✓	
LYSI AME					100												
MITE PEN								50			✓						
EPILOBI						100	40	50							✓		
ARNI LAT	50					50		17						✓			
HERA SPH							60	33							✓		
RANU ESC						50		17									
ERIG PER						50		17						✓			
GALI TRL							60	17									
SENE TRI					50		80	17						✓	✓		
TELL GRA								33									
STRE ANP					50			50			✓					✓	
URTI DIO								17									
MIMU LEW								17									
POA ARC							40	17							✓		
EPIL LAT						50		17						✓	✓		
SIBB PRO						50											
JUNCUS						50		17									
CASTILL						50	20								✓		
CALAMAG	50						60										
ATHY FIL				100	50	50	60	67			✓					✓	
ARUN SYL							40	17									
EPIL ANG				50	50		60							✓			
VIOL GLA				100			60	33									
ELYM GLA							20										
EQUISET						50	40	17							✓	✓	
LUZU PAR						50		17									
OXYR DIG						50											
LEPT PYR														✓			
MEAN TOTAL COVER	50	15	.5	50	85	50	95	50	60	70	65	40	35	85	80	70	70
D BRACH												✓				✓	
HYLO SPL			50														
RHYT LOR		54	50	50													
RHYT ROB		85	50						67			✓					
RHACOMI						50		17						✓			
LOPHOZI	50	15		50					67								✓
DICRANU	100	100		100		50			67			✓	✓				✓
PLEU SCH	50	31	50						67	✓							

APPENDIX B. - Table 12. (con't). Total Frequency for MH Ecosystem Associations

BIOG. UNIT	MHd								MHdp			MHe					MHep
ECOS. ASS.	01	01	02	03	04	05	05	05	01	02	03	01	02	03	05	05	02
SUCC. STAGE	YCC	MCC	MEC	MEC	MEC	NV	HERB	SHRUB	MCC	MEC	MEC	MCC	MEC	MEC	HERB	SHRUB	MEC
NO. OF RELEVES	2	13	2	2	2	2	5	6	3	1	1	1	1	1	1	1	1
SPHAGNUM					100						✓						
CLADINA			50						100	✓			✓				✓
MNIU GLA				100										✓			
MEAN TOTAL COVER	50	60	50	35	70	20	25	13	60	30	60	25	40	15		20	50

APPENDIX C. PLANT SPECIES LIST

The plant species list includes all vascular and non-vascular plants encountered on plot locations. Nomenclature for vascular plants is after Taylor and MacBryde (1977). Lichens follow Hale (1979) and mosses are after Crum, Steere and Anderson (1973).

Scientific Names	Common Names
TREES	
Abies amabilis	Pacific silver fir
Abies lasiocarpa	Subalpine fir
Alnus rubra	Red alder
Betula papyrifera var. papyrifera	Common paper birch
Chamaecyparis nootkatensis	Yellow cedar
Picea sitchensis	Sitka spruce
Populus balsamifera subsp. trichocarpa	Black cottonwood
Pseudotsuga menziesii var. menziesii	Coast Douglas fir
Thuja plicata	Western red cedar
Tsuga heterophylla	Western hemlock
Tsuga mertensiana	Mountain hemlock
SHRUBS	
Acer glabrum var. douglasii	Rocky Mountain maple
Alnus viridis subsp. sinuata	Sitka mountain alder
Amelanchier alnifolia	Saskatoon
Cladothamnus pyroliflorus	Copperbush
Cornus sericea subsp. occidentalis	Western red-osier dogwood
Lonicera involucrata	Twinberry honeysuckle
Menziesia ferruginea subsp. ferruginea	Rusty Pacific menziesia
Oplopanax horridus	Devil's-club
Paxistima myrsinites	Oregon boxwood
Ribes bracteosum	Stink currant
Ribes lacustre	Black swamp gooseberry
Ribes laxiflorum	Trailing black currant
Rosa gymnocarpa	Baldhip rose
Rubus idaeus subsp. melanolasius	American red raspberry
Rubus parviflorus subsp. parviflorus	Western thimbleberry
Rubus spectabilis	Salmonberry
Salix barclayi	Barclays willow
Salix sitchensis	Sitka willow
Salix spp.	Willow
Sambucus racemosa subsp. pubens var. arborescens	Coastal American red elder
Sorbus scopulina	Western mountain-ash
Spiraea douglasii	Hardhack
Vaccinium	Alaskan blueberry
Vaccinium deliciosum	Cascade blueberry
Vaccinium membranaceum	Black blueberry
Vaccinium ovalifolium	Oval-leaved blueberry
Vaccinium parvifolium	Red huckleberry
Viburnum edule	High bush cranberry

HERBS AND DWARF SHRUBS

Achillea millefolium	Yarrow
Actaea rubra subsp. arguta	Red baneberry
Adenocaulon bicolor	Trailplant
Adiantum pedatum subsp. aleuticum	Northern maidenhair fern
Agoseris glauca var. dasycephala	Short-beaked false dandelion
Agrostis scabra	Hair bent grass
Agrostis stolonifera	Creeping bent grass
Agrostis spp.	Bent grass
Anaphalis margaritacea	Common pearly everlasting
Angelica genuflexa	Kneeling angelica
Aquilegia formosa subsp. formosa	Sitka columbine
Arabis lyrata subsp. kamchatika	Lyre-leaved rock cress
Arnica cordifolia	Heart-leaved arnica
Arnica latifolia	Broad-leaved arnica
Arnica mollis	Hairy arnica
Artemisia campestris subsp. borealis	Northern field wormwood
Artemisia michauxiana	Michaux's mugwort
Artemisia spp.	Mugworts
Aruncus dioicus	Sylvan goat's-beard
Aster modestus	Great northern aster
Aster subspicatus var. subspicatus	Douglas' aster
Aster spp.	Aster
Athyrium distentifolium var. americanum	Alpine lady fern
Athyrium filix-femina subsp. cyclosorum	Common lady fern
Blechnum spicant	Deer fern
Botrichium lanceolatum var. lanceolatum	Lance-leaved grape fern
Boykinia occidentalis	Coast boykinia
Calamagrostis canadensis	Bluejoint small reed grass
Caltha leptosepala	White marsh-marigold
Campanula rotundifolia	Common harebell
Carex bipartita	Two-parted sedge
Carex deweyana	Dewey's sedge
Carex enanderi	Enander's sedge
Carex lenticularis	Lenticular sedge
Carex macrochaeta	Large-awned sedge
Carex media subsp. media	Scandinavian sedge
Carex mertensii subsp. mertensii	Merten's sedge
Carex pauciflora	Few-flowered sedge
Carex paupercula	Poor sedge
Carex rostrata	Beaked sedge
Carex sartwellii	Sartwell's sedge
Carex scirpoidea	Northern single-spiked sedge
Carex sitchensis	Sitka sedge
Carex spectabilis	Showy sedge
Carex spp.	Sedge
Cassiope mertensiana var. mertensiana	Merten's cassiope
Castilleja spp.	Indian paintbrush
Cinna latifolia	Wood reed grass
Circaea alpina	Alpine enchanter's-nightshade
Claytonia sibirica	Siberian spring beauty
Clintonia uniflora	Blue-bead clintonia
Collinsia parviflora	Small-flowered blue-eyed Mary

Coptis trifolia	Three-leaved goldthread
Corallorhiza maculata var. maculata	Spotted coralroot
Cornus unalaschkensis	Western cordilleran bunchberry
Cryptogramma crispa subsp. acrostichoides var. acrostichoides	Parsley fern
Cystopteris fragilis	Fragile fern
Deschampsia cespitosa	Tufted hair grass
Disporum hookeri var. oreganum	Hooker's fairybells
Drosera rotundifolia	Round-leaved sundew
Dryopteris assimilis	Spiny shield fern
Dryopteris filix-mas	Male fern
Elymus glaucus	Blue wild rye grass
Elymus hirsutus	Hairy wild rye grass
Epilobium angustifolium	Fireweed
Epilobium lactiflorum	
Epilobium latifolium subsp. latifolium	Broad-leaved willowherb
Epilobium spp.	Willowherb
Equisetum arvense	Common horsetail
Equisetum palustre	Marsh horsetail
Equisetum variegatum	Northern scouring rush
Equisetum spp.	Horsetail
Erigeron peregrinus	Subalpine fleabane
Eriophorum spp.	Cotton-grass
Fauria crista-galli subsp. crista-galli	Deer-cabbage
Festuca occidentalis	Western fescue
Festuca subulata	Bearded fescue
Galium kamtschaticum	Northern wild licorice
Galium palustre	Common marsh bedstraw
Galium triflorum	Sweet-scented bedstraw
Geum calthifolium subsp. calthifolium	Caltha-leaved avens
Geum macrophyllum var. macrophyllum	Large-leaved avens
Goodyera oblongifolia	Large-leaved rattlesnake orchid
Gymnocarpium dryopteris var. disjunctum	Oak fern
Heracleum sphondylium subsp. montanum	Common cow-parsnip
Heuchera glabra	Smooth alumroot
Hieracium albiflorum	White hawkweed
Hieracium triste	Woolly hawkweed
Hypopitys monotropa	Fringed pinesap
Juncus drummondii	Drummond's rush
Juncus ensifolius	Sword-leaved rush
Juncus mertensianus	Merten's rush
Kalmia microphylla	Western swamp laurel
Leptarrhena pyrolifolia	Leatherleaf saxifrage
Listera caurina	Northwestern twayblade
Listera cordata	Heart-leaved twayblade
Linnaea borealis	Northern twinflower
Luetkea pectinata	Luetkea
Lupinus nootkatensis	Nootka lupine
Luzula sp.	Wood-rush
Lycopodium alpinum	Alpine club-moss
Lycopodium clavatum	Running club-moss
Lycopodium complanatum	Ground-cedar
Lycopodium sitchense var. sitchense	Alaska club-moss
Lysichiton americanum	American skunk-cabbage

Maianthemum dilatatum	Two-leaved false Solomon's-seal
Menyanthes trifoliata	Buckbean
Mimulus guttatus	Monkeyflower
Mimulus lewisii	Lewis' monkeyflower
Mimulus tilingii	Large mountain monkeyflower
Mitella pentandra	Five-stamened mitrewort
Moneses uniflora	One-flowered wintergreen
Montia parvifolia	Small-leaved montia
Nuphar lutea subsp. polysepala	Yellow pond lily
Orthilia secunda subsp. secunda	Few-flowered one-sided wintergreen
Osmorhiza chilensis	Mountain sweetcicely
Osmorhiza purpurea	Purple sweetcicely
Oxyria digyna	Mountain sorrel
Parnassia fimbriata var. fimbriata	Fringed grass-of-parnassus
Pedicularis ornithorhynca	Bird's-beak lousewort
Penstemon davidsonii	Davidson's penstemon
Penstemon serrulatus	Coast penstemon
Petasites nivalis	Greene's colt's-foot
Phleum alpinum var. commutatum	Alpine timothy
Phyllodoce empetriformis	Red mountain-heather
Platanthera dilatata var. dilatata	Fragrant white rein orchid
Platanthera stricta	Slender rein orchid
Poa alpina	Alpine blue grass
Poa arctica	Arctic blue grass
Poa gracillima	Pacific blue grass
Poa leptocoma	Bog blue grass
Poa spp.	Blue grass
Polypodium glycyrriza	Licorice fern
Polystichum braunii subsp. andersonii	Anderson's holly fern
Polystichum munitum	Western sword fern
Potentilla arguta	White cinquefoil
Potentilla palustris	Marsh cinquefoil
Prenanthes alata	Western rattlesnake root
Prunella vulgaris	Common self-heal
Pteridium aquilinum subsp. aquilinum var. pubescens	Western bracken
Pyrola asarifolia var. purpurea	Common pink pyrola
Ranunculus cooleyae	Cooley's buttercup
Ranunculus eschscholtzii	Subalpine buttercup
Romanzoffia sitchensis	Sitka romanzoffia
Rubus pedatus	Five-leaved creeping raspberry
Sagina saginoides	Arctic pearlwort
Sanguisorba canadensis subsp. latifolia	Sitka burnet
Saxifraga ferruginea	Alaska saxifrage
Saxifraga nelsoniana	Cordate-leaved saxifrage
Saxifraga tolmiei	Tolmie's saxifrage
Scheuchzeria palustris subsp. americana	Scheuchzeria
Sedum divergens	Spreading stonecrop
Senecio triangularis	Arrow-leaved ragwort
Sibbaldia procumbens	Creeping sibbaldia
Smilacina racemosa var. racemosa	False Solomon's-seal
Smilacina stellata	Star-flowered false Solomon's-seal

Streptopus amplexifolius var. americanus	Cucumberroot twistedstalk
Streptopus roseus var. curvipes	Simple-stemmed twistedstalk
Tellima grandiflora	Tall fringecup
Thelypteris limbosperma	Mountain wood fern
Tiarella trifoliata	Trifoliate-leaved foamflower
Tiarella unifoliata	Unifoliate-leaved foamflower
Tofieldia glutinosa	Sticky false asphodel
Torreyochloa pauciflora	Weak false manna
Trautvetteria caroliniensis	False bugbane
Trientalis europaea subsp. arctica	Northern starflower
Trisetum cernuum	Nodding trisetum
Trisetum spicatum var. molle	Spike trisetum
Urtica dioica subsp. gracilis	American stinging nettle
Vaccinium uliginosum	Bog blueberry
Vahlodea atropurpurea subsp. paramushirensis	Mountain vahlodea
Valeriana sitchensis subsp. sitchensis	Sitka valerian
Veratrum viride subsp. escholtzii	Green false hellebore
Veronica wormskjoldii var. wormskjoldii	Alpine speedwell
Viola adunca subsp. adunca	Early blue violet
Viola glabella	Yellow wood violet
Viola palustris	Marsh violet
Viola spp.	Violet

MOSSES, LICHENS AND LIVERWORTS

Brachythecium spp.
Cladina mitis
Cladina rangiferina
Cladina spp.
Cladonia amaurocraea
Cladonia bellidiflora
Cladonia cariosa
Cladonia coccifera
Cladonia cornuta
Cladonia gonecha
Cladonia gracilis
Cladonia spp.
Conocephalum conicum
Dicranum spp.
Homalothecium spp.
Hylocomium splendens
Isothecium spiculiferum
Lobaria oregana
Lophozia spp.
Mnium glabrescens
Mnium insigne
Mnium spinulosum
Mnium spp.
Neckera menziesii
Peltigera aphthosa
Peltigera canina
Plagiochila asplenioides
Plagiochila spp.
Plagiothecium undulatum

Pleurozium schreberei
Pogonatum jubatum
Polytrichum juniperinum
Polytrichum spp.
Ptilium crista-castrensis
Rhacomitrium spp.
Rhytidiadelphus loreus
Rhytidiadelphus triquetrus
Rhytidiopsis robusta
Scapania bolanderi
Sphaerophorus globosus
Sphagnum spp.
Stereocaulon paschale
Stereocaulon spp.
Usnea spp.

Wildlife Working Reports should not be cited because of the preliminary nature of the data contained within.

WR-1 Progress report - coastal grizzly research project: Year 1. A.N. Hamilton. October 1984. 43pp. (Also printed as WHR-9)

WR-2 Progress report - coastal grizzly research project: Year 2. A.N. Hamilton and W.R. Archibald. October 1984. 27pp. (Also printed as WHR-10)

WR-3 Telemetry: Comments and suggestions from the coastal grizzly project 1983. A.E. Derocher. October 1984. 14pp. (Also printed as WHR-11)

WR-4 Habitat types of the Kimsquit River estuary. C. Clement. October 1984. 27pp. (Also printed as WHR-12)

WR-5 Biogeoclimatic units and ecosystem associations of the Kimsquit drainage. C. Clement. October 1984. 89pp. (Also printed as WHR-13)

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